

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
31 July 2003 (31.07.2003)

PCT

(10) International Publication Number  
**WO 03/062206 A2**

(51) International Patent Classification<sup>7</sup>: **C07D 231/16**,  
231/14, 231/12, 401/12, 409/04, A61K 31/415, 31/4155,  
A61P 7/02, 9/10

(21) International Application Number: PCT/US03/02059

(22) International Filing Date: 23 January 2003 (23.01.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
60/386,198 23 January 2002 (23.01.2002) US  
60/386,384 5 June 2002 (05.06.2002) US  
60/401,467 5 August 2002 (05.08.2002) US

(71) Applicant (for all designated States except US): **ARENA PHARMACEUTICALS, INC.** [US/US]; 6166 Nancy Ridge Drive, San Diego, CA 92121 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **TEEGARDEN, Bradley** [US/US]; 11933 Windom Peak Way, San Diego, CA 92131 (US). **DROUET, Keith** [US/US]; 10751 Juniper

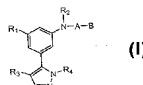
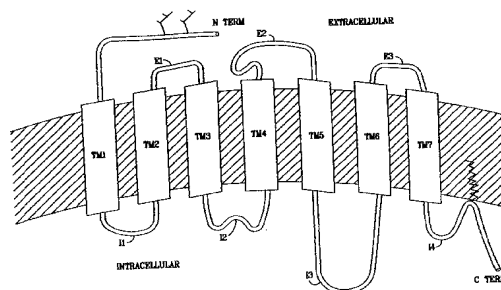
Park Lane, San Diego, CA 92121 (US). **JAYAKUMAR, Honnappa** [US/US]; 13323 Caminito Ciera, #107, San Diego, CA 92129 (US). **THOMSEN, William** [US/US]; 13603 Mar Scenic, Del Mar, CA 92014 (US). **MAFFUID, Paul** [US/US]; 3326 Avenida Anacapa, Carlsbad, CA 92009 (US). **ELWELL, Katie** [US/US]; 103 Guerrero Court, Solana Beach, CA 92075 (US). **FOSTER, Richard** [GB/GB]; Puffins Cottage, Poundstock Bude, Cornwall EX23 0AX (GB). **LAWLESS, Michael** [US/US]; 1847 Willow Oak Drive, St. Charles, MO 63303 (US). **LIU, Qian** [US/US]; 310 Shady Meadows Drive, Ballwin, MO 63011 (US). **SMITH, Julian** [GB/GB]; 2 Exeview Cottages, Whitestone, Exeter, Devon EX4 2JJ (GB). **FEICHTINGER, Konrad** [DE/US]; 3533 6th Avenue, #3, San Diego, CA 92103 (US).

(74) Agents: **BRADFUTE, David** et al.; Arena Pharmaceuticals, Inc., 6166 Nancy Ridge Drive, San Diego, CA 92121 (US).

(81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE,

[Continued on next page]

(54) Title: SMALL MOLECULE MODULATORS OF THE 5-HT<sub>2A</sub> SEROTONIN RECEPTOR USEFUL FOR THE PROPHYLAXIS AND TREATMENT OF DISORDERS RELATED THERETO



(57) Abstract: The present invention relates to certain pyrazole derivatives of Formula (I) and pharmaceutical compositions thereof that modulate the activity of the 5-HT<sub>2A</sub> serotonin receptor. Formula (I): Compounds and pharmaceutical compositions thereof are directed to methods useful in the prophylaxis or treatment of reducing platelet aggregation, coronary artery disease, myocardial infarction, transient ischemic attack, angina, stroke, atrial fibrillation, reducing the risk of blood clot formation, asthma or symptoms thereof, agitation or a symptom, behavioral disorders, drug induced psychosis, excitative psychosis, Gilles de la Tourette's syndrome, manic disorder, organic or NOS psychosis, psychotic disorder, psychosis, acute schizophrenia, chronic schizophrenia and NOS schizophrenia and related disorders. The present invention also relates to the method of prophylaxis or treatment of 5-HT<sub>2A</sub> serotonin receptor mediated disorders in combination with a dopamine D2 receptor antagonist such as haloperidol, administered separately or together.



WO 03/062206 A2



SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

**(84) Designated States (regional):** ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

**Published:**

— without international search report and to be republished upon receipt of that report

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

**SMALL MOLECULE MODULATORS OF THE 5-HT<sub>2A</sub> SEROTONIN RECEPTOR  
USEFUL FOR THE PROPHYLAXIS AND TREATMENT OF DISORDERS  
RELATED THERETO**

5

**FIELD OF THE INVENTION**

10       The present invention relates to certain pyrazole derivatives of Formula (I) and pharmaceutical compositions thereof that modulate the activity of the 5-HT<sub>2A</sub> serotonin receptor. Compounds and pharmaceutical compositions thereof are directed to methods useful in the prophylaxis or treatment of reducing platelet aggregation, coronary artery disease, myocardial infarction, transient ischemic attack, angina, stroke, atrial fibrillation, reducing the risk of blood clot  
15       formation, asthma or symptoms thereof, agitation or a symptom, behavioral disorders, drug induced psychosis, excitative psychosis, Gilles de la Tourette's syndrome, manic disorder, organic or NOS psychosis, psychotic disorder, psychosis, acute schizophrenia, chronic schizophrenia and NOS schizophrenia and related disorders.

20       The present invention also relates to the method of prophylaxis or treatment of 5-HT<sub>2A</sub> serotonin receptor mediated disorders in combination with a dopamine D2 receptor antagonist such as haloperidol, administered separately or together.

**BACKGROUND OF THE INVENTION**

**I.       G protein-coupled receptors**

25       [0001]       G protein-coupled receptors share a common structural motif. All these receptors have seven sequences of between 22 to 24 hydrophobic amino acids that form seven alpha helices, each of which spans the membrane. The transmembrane helices are joined by strands of amino acids having a larger loop between the fourth and fifth transmembrane helix on the extracellular side of the membrane. Another larger loop, composed primarily of hydrophilic amino acids, joins transmembrane helices five  
30       and six on the intracellular side of the membrane. The carboxy terminus of the receptor lies intracellularly with the amino terminus in the extracellular space. It is thought that the loop joining helices five and six, as well as, the carboxy terminus, interact with the G protein. Currently, Gq, Gs, Gi and Go are G proteins that have been identified. The general structure of G protein-coupled receptors is shown in Figure 1.

-2-

[0002] Under physiological conditions, G protein-coupled receptors exist in the cell membrane in equilibrium between two different states or conformations: an “inactive” state and an “active” state. As shown schematically in Figure 2, a receptor in an inactive state is unable to link to the intracellular transduction pathway to produce a biological response. Changing the receptor conformation to the active state allows linkage to the transduction pathway and produces a biological response.

[0003] A receptor may be stabilized in an active state by an endogenous ligand or an exogenous agonist ligand. Recent discoveries such as, including but not exclusively limited to, modifications to the amino acid sequence of the receptor provide means other than ligands to stabilize the active state conformation. These means effectively stabilize the receptor in an active state by simulating the effect of a ligand binding to the receptor. Stabilization by such ligand-independent means is termed “constitutive receptor activation.”

#### Serotonin receptors

[0004] Receptors for serotonin (5-hydroxytryptamine, 5-HT) are an important class of G protein-coupled receptors. Serotonin is thought to play a role in processes related to learning and memory, sleep, thermoregulation, mood, motor activity, pain, sexual and aggressive behaviors, appetite, neurodegenerative regulation, and biological rhythms. Not surprisingly, serotonin is linked to pathophysiological conditions such as anxiety, depression, obsessive-compulsive disorders, schizophrenia, suicide, autism, migraine, emesis, alcoholism, and neurodegenerative disorders. With respect to on anti-psychotic treatment approaches focused on the serotonin receptors, these types of therapeutics can generally be divided into two classes, the “typical” and the “atypical.” Both have anti-psychotic effects, but the typicals also include concomitant motor-related side effects (extra pyramidal syndromes, *e.g.*, lip-smacking, tongue darting, locomotor movement, etc). Such side effects are thought to be associated with the compounds interacting with other receptors, such as the human dopamine D2 receptor in the nigro-striatal pathway. Therefore, an atypical treatment is preferred. Haloperidol is considered a typical anti-psychotic, and clozapine is considered an atypical anti-psychotic.

[0005] Serotonin receptors are divided into seven subfamilies, referred to as 5-HT1 through 5-HT7, inclusive. These subfamilies are further divided into subtypes. For example, the 5-HT2 subfamily is divided into three receptor subtypes: 5-HT<sub>2A</sub>, 5-HT<sub>2B</sub>, and 5-HT<sub>2C</sub>. The human 5-HT<sub>2C</sub> receptor was first isolated and cloned in 1987, and the human 5-HT<sub>2A</sub> receptor was first isolated and cloned in 1990. These two receptors are thought to be the site of action of hallucinogenic drugs. Additionally, antagonists to the 5-HT<sub>2A</sub> and 5-HT<sub>2C</sub> receptors are believed to be useful in treating depression, anxiety, psychosis, and eating disorders.



-3-

[0006] U.S. Patent Number 4,985,352 describes the isolation, characterization, and expression of a functional cDNA clone encoding the entire human 5-HT<sub>1C</sub> receptor (now known as the 5-HT<sub>2C</sub> receptor). U.S. Patent Number 5,661,012 describes the isolation, characterization, and expression of a functional cDNA clone encoding the entire human 5-HT<sub>2A</sub> receptor.

5 [0007] Mutations of the endogenous forms of the rat 5-HT<sub>2A</sub> and rat 5-HT<sub>2C</sub> receptors have been reported to lead to constitutive activation of these receptors (5-HT<sub>2A</sub>: Casey, C. *et al.* (1996) *Society for Neuroscience Abstracts*, 22:699.10, hereinafter "Casey"; 5-HT<sub>2C</sub>: Herrick-Davis, K., and Teitler, M. (1996) *Society for Neuroscience Abstracts*, 22:699.18, hereinafter "Herrick-Davis 1"; and Herrick-Davis, K. *et al.* (1997) *J. Neurochemistry* 69(3): 1138, hereinafter "Herrick-Davis-2"). Casey  
10 describes a mutation of the cysteine residue at position 322 of the rat 5-HT<sub>2A</sub> receptor to lysine (C322K), glutamine (C322Q), and arginine (C322R) which reportedly led to constitutive activation. Herrick-Davis 1 and Herrick-Davis 2 describe mutations of the serine residue at position 312 of the rat 5-HT<sub>2C</sub> receptor to phenylalanine (S312F) and lysine (S312K), which reportedly led to constitutive activation.

15

#### SUMMARY OF THE INVENTION

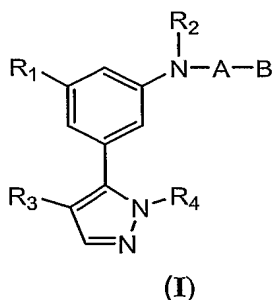
[0008] The present invention relates to non-endogenous, constitutively activated forms of the human 5-HT<sub>2A</sub> and human 5-HT<sub>2C</sub> receptors and various uses of such receptors. Further disclosed are small molecule modulators of these receptors. Most preferably, these modulators have inverse agonist  
20 characteristics at the receptor.

[0009] More specifically, the present invention discloses nucleic acid molecules and the proteins for three non-endogenous, constitutively activated human serotonin receptors, referred to herein as, AP-1, AP-3, and AP-4. The AP-1 receptor is a constitutively active form of the human 5-HT<sub>2C</sub> receptor created by an S310K point mutation. The AP-3 receptor is a constitutively active form  
25 of the human 5-HT<sub>2A</sub> receptor whereby the intracellular loop 3 (IC3) portion and the cytoplasmic-tail portion of the endogenous human 5-HT<sub>2A</sub> receptor have been replaced with the IC3 portion and the cytoplasmic-tail portion of the human 5-HT<sub>2C</sub> receptor. The AP-4 receptor is a constitutively active form of the human 5-HT<sub>2A</sub> receptor whereby (1) the region of the intracellular third loop between the proline of the transmembrane 5 region (TM5) and the proline of TM6 of the endogenous human 5-HT<sub>2A</sub> receptor has been replaced with the corresponding region of the human 5-HT<sub>2C</sub> receptor  
30 (including a S310K point mutation); and (2) the cytoplasmic-tail portion of the endogenous human 5-HT<sub>2A</sub> receptor has been replaced with the cytoplasmic-tail portion of the endogenous human 5-HT<sub>2C</sub> receptor.

-4-

[0010] The invention also provides assays that may be used to directly identify candidate compounds as agonists, partial agonists or inverse agonists to non-endogenous, constitutively activated human serotonin receptors; such candidate compounds can then be utilized in pharmaceutical composition(s) for treatment of diseases and disorders which are related to the human 5-HT<sub>2A</sub> and/or human 5-HT<sub>2C</sub> receptors.

[0011] The invention also provides compounds that exhibit high selectivity 5-HT<sub>2A</sub> activity. More specifically, the compounds possessing 5-HT<sub>2A</sub> receptor activity are designated by the general Formula (I):



10 wherein:

i) R<sub>1</sub> is H, halogens, NR<sub>5</sub>R<sub>6</sub>, OH or OR<sub>7</sub>, wherein

R<sub>5</sub> and R<sub>6</sub> are independently H, or C<sub>1-6</sub> alkyl, or C<sub>2-6</sub> alkenyl, or cycloalkyl, or aryl, or CH<sub>2</sub> aryl group and each said group may be optionally substituted by up to four substituents in any position independently selected from CF<sub>3</sub>, CCl<sub>3</sub>, Me, NO<sub>2</sub>, OH, OMe, OEt, CONR<sub>8</sub>R<sub>9</sub>, NR<sub>8</sub>R<sub>9</sub>, NHCOCH<sub>3</sub>, OCF<sub>3</sub>, SMe, COOR<sub>10</sub>, SO<sub>3</sub>R<sub>8</sub>, SO<sub>2</sub>NR<sub>8</sub>R<sub>9</sub>, COMe, COEt, CO-lower alkyl, SCF<sub>3</sub>, CN, C<sub>2-6</sub> alkenyl, H, halogens, C<sub>1-4</sub> alkoxy, C<sub>3-6</sub> cycloalkyl, C<sub>1-6</sub> alkyl, and aryl wherein each of the C<sub>3-6</sub> cycloalkyl, C<sub>1-6</sub> alkyl, or aryl groups may be further optionally substituted by up to four substituents in any position independently selected from CF<sub>3</sub>, CCl<sub>3</sub>, Me, NO<sub>2</sub>, OH, OMe, OEt, CONR<sub>8</sub>R<sub>9</sub>, NR<sub>8</sub>R<sub>9</sub>, NHCOCH<sub>3</sub>, OCF<sub>3</sub>, SMe, COOR<sub>10</sub>, SO<sub>2</sub>NR<sub>8</sub>R<sub>9</sub>, SO<sub>3</sub>R<sub>10</sub>, COMe, COEt, CO-lower alkyl, SCF<sub>3</sub>, CN, C<sub>2-6</sub> alkenyl, H, halogens, C<sub>1-4</sub> alkoxy, C<sub>3-6</sub> cycloalkyl, C<sub>1-6</sub> alkyl, and aryl; or

R<sub>5</sub> and R<sub>6</sub> may form part of a 5, 6 or 7 membered cyclic structure which may be either saturated or unsaturated and that may contain up to four heteroatoms selected from O, N or S and said cyclic structure may be optionally substituted by up to four substituents in any position independently selected from CF<sub>3</sub>, CCl<sub>3</sub>, Me, NO<sub>2</sub>, OH, OMe, OEt, OCF<sub>3</sub>, SMe, COOR<sub>10</sub>, SO<sub>2</sub>NR<sub>8</sub>R<sub>9</sub>, SO<sub>3</sub>R<sub>10</sub>, NHCOCH<sub>3</sub>, COEt, COMe, or halogen;

-5-

R<sub>8</sub> and R<sub>9</sub> are independently a H, or C<sub>1-6</sub> alkyl, or C<sub>2-6</sub> alkenyl, or cycloalkyl, or aryl, or CH<sub>2</sub> aryl group and each said group may be optionally substituted by up to four substituents in any position independently selected from halogen, CF<sub>3</sub>, OCF<sub>3</sub>, OEt, CCl<sub>3</sub>, Me, NO<sub>2</sub>, OH, OMe, SMe, COMe, CN, COOR<sub>10</sub>, SO<sub>3</sub>R<sub>10</sub>, COEt, NHCOCH<sub>3</sub>, or aryl;

R<sub>10</sub> is H or C<sub>1-6</sub> alkyl;

R<sub>7</sub> is H or C<sub>1-6</sub> alkyl;

ii) R<sub>2</sub> is H, straight chain or branched C<sub>1-6</sub> alkyl, C<sub>2-6</sub> alkenyl, or cycloalkyl;

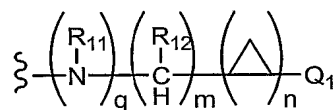
iii) R<sub>3</sub> is halogen, carboxy, CN, alkoxycarbonyl, straight chain or branched C<sub>1-6</sub> alkyl, C<sub>2-6</sub> alkenyl, C<sub>2-6</sub> alkynyl, cycloalkyl, aryl or heteroaryl, wherein each of said alkoxycarbonyl, straight chain or branched C<sub>1-6</sub> alkyl, C<sub>2-6</sub> alkenyl, C<sub>2-6</sub> alkynyl, cycloalkyl, aryl or heteroaryl groups can be optionally substituted with up to four substituents in any position selected from OH, OR<sub>10</sub>, NR<sub>8</sub>R<sub>9</sub>, halogen, -C(p)<sub>3</sub>, or -O-C(p)<sub>3</sub> where p is halogen, and said cycloalkyl, aryl or heteroaryl groups can alternatively or additionally be optionally substituted with up to four alkyl substituents in any position;

iv) R<sub>4</sub> is C<sub>1-6</sub> alkyl, C<sub>2-6</sub> alkenyl, or cycloalkyl;

v) A is C(=O), C(=S) or SO<sub>2</sub>;

vi) B is L<sub>1</sub> or L<sub>2</sub>;

L<sub>1</sub> is:



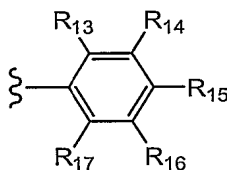
q is 0 or 1;

m is 0 or 1;

n is 0 or 1;

R<sub>11</sub> and R<sub>12</sub> are each independently H, straight chain or branched C<sub>1-6</sub> alkyl, C<sub>2-6</sub> alkenyl, or cycloalkyl;

Q<sub>1</sub> is:



wherein:

R<sub>13</sub>, R<sub>14</sub>, R<sub>15</sub>, R<sub>16</sub> and R<sub>17</sub> are each independently H, halogen, CN, NR<sub>8</sub>R<sub>9</sub>, COOR<sub>10</sub>, SR<sub>10</sub>, straight chain or branched C<sub>1-6</sub> alkyl, C<sub>2-6</sub> alkenyl, C<sub>2-6</sub> alkynyl, cycloalkyl, aryl, alkylaryl, arylalkyl or heteroaryl, wherein each of

-6-

5 said alkoxycarbonyl, straight chain or branched C<sub>1-6</sub> alkyl, C<sub>2-6</sub> alkenyl, C<sub>2-6</sub> alkynyl, cycloalkyl, aryl, alkylaryl, arylalkyl or heteroaryl groups can be optionally substituted with up to four substituents in any position selected from NO<sub>2</sub>, OR<sub>10</sub>, NR<sub>8</sub>R<sub>9</sub>, halogen, -C(p)<sub>3</sub>, or -O-C(p)<sub>3</sub> where p is halogen, and  
said cycloalkyl, aryl, alkylaryl, arylalkyl or heteroaryl groups can  
alternatively or additionally be optionally substituted with up to four alkyl  
substituents in any position;

10 L<sub>2</sub> is -O-Q<sub>2</sub> wherein Q<sub>2</sub> is straight chain or branched C<sub>1-6</sub> alkyl, C<sub>2-6</sub> alkenyl, C<sub>2-6</sub> alkynyl, cycloalkyl, aryl, alkylaryl, arylalkyl, wherein each of said cycloalkyl, aryl, alkylaryl, or arylalkyl groups can be optionally substituted with up to four substituents in any position selected from NO<sub>2</sub>, OR<sub>7</sub>, halogen, -C(p)<sub>3</sub>, or -O-C(p)<sub>3</sub> where p is halogen, or an aliphatic or aromatic heterocycle, and said cycloalkyl, aryl, alkylaryl, and arylalkyl groups can alternatively or additionally be optionally  
15 substituted with up to four alkyl substituents in any position; or  
a pharmaceutically acceptable salt.

[0012] These and other aspects of the invention disclosed herein will be set forth in greater detail as the patent disclosure proceeds.

20

## BRIEF DESCRIPTION OF THE DRAWINGS

[0013] In the following figures, bold typeface indicates the location of the mutation in the non-endogenous, constitutively activated receptor relative to the corresponding endogenous receptor.

[0014] **Figure 1** shows a generalized structure of a G protein-coupled receptor with the numbers assigned to the transmembrane helices, the intracellular loops, and the extracellular loops.

25 [0015] **Figure 2** schematically shows the active and inactive states for a typical G protein-coupled receptor and the linkage of the active state to the second messenger transduction pathway.

[0016] **Figure 3a** provides the nucleic acid sequence of the endogenous human 5-HT<sub>2A</sub> receptor (SEQ.ID.NO.:22).

[0017] **Figure 3b** provides the corresponding amino acid sequence of the endogenous human  
30 5-HT<sub>2A</sub> receptor (SEQ.ID.NO.:23).

-7-

[0018] **Figure 4a** provides the nucleic acid sequence of the endogenous human 5-HT<sub>2C</sub> receptor (SEQ.ID.NO.:24).

[0019] **Figure 4b** provides the corresponding amino acid sequence of the endogenous human 5-HT<sub>2C</sub> receptor (SEQ.ID.NO.:25).

5 [0020] **Figure 5a** provides the nucleic acid sequence of a constitutively active form of the human 5-HT<sub>2C</sub> receptor ("AP-1 cDNA" - SEQ.ID.NO.:26).

[0021] **Figure 5b** provides the corresponding amino acid sequence of the AP-1 cDNA ("AP-1" - SEQ.ID.NO.:27).

10 [0022] **Figure 6a** provides the nucleic acid sequence of a constitutively active form of the human 5-HT<sub>2A</sub> receptor whereby the IC3 portion and the cytoplasmic-tail portion of the endogenous 5-HT<sub>2A</sub> receptor have been replaced with the IC3 portion and the cytoplasmic-tail portion of the human 5-HT<sub>2C</sub> receptor ("AP-3 cDNA" - SEQ.ID.NO.:28).

[0023] **Figure 6b** provides the corresponding amino acid sequence of the AP-3 cDNA ("AP-3" - SEQ.ID.NO.:29).

15 [0024] **Figure 6c** provides a schematic representation of AP-3, where the dashed-lines represent the portion obtained from the human 5-HT<sub>2C</sub> receptor.

20 [0025] **Figure 7a** provides the nucleic acid sequence of a constitutively active form of the human 5-HT<sub>2A</sub> receptor whereby (1) the region of the between the proline of TM5 and the proline of TM6 of the endogenous human 5-HT<sub>2A</sub> receptor has been replaced with the corresponding region of the human 5-HT<sub>2C</sub> receptor (including a S310K point mutation); and (2) the cytoplasmic-tail portion of the endogenous 5-HT<sub>2A</sub> receptor has been replaced with the cytoplasmic-tail portion of the endogenous human 5-HT<sub>2C</sub> receptor ("AP-4 cDNA" - SEQ.ID.NO.:30).

[0026] **Figure 7b** provides the corresponding amino acid sequence of the AP-4 cDNA ("AP-4" - SEQ.ID.NO.:31).

25 [0027] **Figure 7c** provides a schematic representation of the mutated 5-HT<sub>2A</sub> receptor of Figure 7b where the dashed-lines represent the portion obtained from the human 5-HT<sub>2C</sub> receptor.

[0028] **Figure 8** is a representation of the preferred vector, pCMV, used herein.

-8-

[0029] **Figure 9** is a diagram illustrating (1) enhanced ( $^{35}\text{S}$ )GTP $\gamma$ S binding to membranes prepared from COS cells expressing the endogenous human 5-HT<sub>2C</sub> receptor in response to serotonin, and (2) inhibition by mianserin using wheatgerm agglutinin scintillation proximity beads. The concentration of ( $^{35}\text{S}$ )GTP $\gamma$ S was held constant at 0.3 nM, and the concentration of GDP was held at 1  $\mu\text{M}$ . The concentration of the membrane protein was 12.5  $\mu\text{g}$ .

[0030] **Figure 10** is a diagram showing serotonin stimulation of ( $^{35}\text{S}$ )GTP $\gamma$ S binding to membranes expressing AP-1 receptors in 293T cells and the inhibition by 30  $\mu\text{M}$  mianserin on Wallac<sup>TM</sup> scintistrips.

[0031] **Figures 11A and 11B** are diagrams showing the effects of protein concentration on ( $^{35}\text{S}$ )GTP $\gamma$ S binding in membranes prepared from 293T cells transfected with the endogenous human 5-HT<sub>2C</sub> receptors and AP-1 receptors compared to cells transfected with the control vector (pCMV) alone in the absence (**Figure 11A**) and presence (**Figure 11B**) of 10  $\mu\text{M}$  serotonin. The radiolabeled concentration of ( $^{35}\text{S}$ )GTP $\gamma$ S was held constant at 0.3 nM, and the GDP concentration was held constant at 1  $\mu\text{M}$ . The assay was performed on 96-well format on Wallac<sup>TM</sup> scintistrips.

[0032] **Figure 12** provides bar-graph comparisons of inositol tris-phosphate ("IP3") production between the endogenous human 5-HT<sub>2A</sub> receptor and AP-2, a mutated form of the receptor.

[0033] **Figure 13** provides bar-graph comparisons of inositol tris-phosphate ("IP3") production between the endogenous human 5-HT<sub>2A</sub> receptor and AP-4, a mutated form of the receptor.

[0034] **Figure 14** provides bar graph comparisons of IP3 production between the endogenous human 5-HT<sub>2A</sub> receptor and AP-3, a mutated form of the receptor.

[0035] **Figure 15** provides bar-graph comparisons of IP3 production between the endogenous human 5-HT<sub>2C</sub> receptor and AP-1.

[0036] **Figures 16A-C** provides representative autoradiograms showing displacement of [ $^{125}\text{I}$ ]-LSD from brain sections by spiperone and Compound 1.

[0037] **Figures 17A-C** show *in vivo* response of animals to Compound 2 exposure.

**DEFINITIONS**

**[0038]** The scientific literature that has evolved around receptors has adopted a number of terms to refer to ligands having various effects on receptors. For clarity and consistency, the following definitions will be used throughout this patent document. To the extent that these definitions conflict  
5 with other definitions for these terms, the following definitions shall control.

**[0039]** AGONISTS shall mean moieties that activate the intracellular response when they bind to the receptor, or enhance GTP binding to membranes.

**[0040]** AMINO ACID ABBREVIATIONS used herein are set out in TABLE 1:

**TABLE 1**

ALANINE	ALA	A
ARGININE	ARG	R
ASPARAGINE	ASN	N
ASPARTIC ACID	ASP	D
CYSTEINE	CYS	C
GLUTAMIC ACID	GLU	E
GLUTAMINE	GLN	Q
GLYCINE	GLY	G
HISTIDINE	HIS	H
ISOLEUCINE	ILE	I
LEUCINE	LEU	L
LYSINE	LYS	K
METHIONINE	MET	M
PHENYLALANINE	PHE	F
PROLINE	PRO	P
SERINE	SER	S
THREONINE	THR	T
TRYPTOPHAN	TRP	W
TYROSINE	TYR	Y
VALINE	VAL	V

-10-

- [0041] PARTIAL AGONISTS shall mean moieties which activate the intracellular response when they bind to the receptor to a lesser degree/extent than do agonists, or enhance GTP binding to membranes to a lesser degree/extent than do agonists.
- 5 [0042] ANTAGONIST shall mean moieties that competitively bind to the receptor at the same site as the agonists but which do not activate the intracellular response initiated by the active form of the receptor, and can thereby inhibit the intracellular responses by agonists or partial agonists. ANTAGONISTS do not diminish the baseline intracellular response in the absence of an agonist or partial agonist.
- 10 [0043] CANDIDATE COMPOUND shall mean a molecule (for example, and not limitation, a chemical compound) which is amenable to a screening technique.
- [0044] COMPOSITION shall mean a material comprising at least two compounds or two components; for example, and not limitation, a Pharmaceutical Composition is a Composition.
- [0045] COMPOUND EFFICACY shall mean a measurement of the ability of a compound to inhibit or stimulate receptor functionality, as opposed to receptor binding affinity.
- 15 [0046] CONSTITUTIVELY ACTIVATED RECEPTOR shall mean a receptor subject to constitutive receptor activation.
- [0047] CONSTITUTIVE RECEPTOR ACTIVATION shall mean stabilization of a receptor in the active state by means other than binding of the receptor with its endogenous ligand or a chemical equivalent thereof.
- 20 [0048] CONTACT or CONTACTING shall mean bringing at least two moieties together, whether in an in vitro system or an in vivo system.
- [0049] ENDOGENOUS shall mean a material that a mammal naturally produces. ENDOGENOUS in reference to, for example and not limitation, the term "receptor" shall mean that which is naturally produced by a mammal (for example, and not limitation, a human) or a virus.
- 25 [0050] In contrast, the term NON-ENDOGENOUS in this context shall mean that which is not naturally produced by a mammal (for example, and not limitation, a human) or a virus. For example, and not limitation, a receptor which is not constitutively active in its endogenous form, but when manipulated becomes constitutively active, is most preferably referred to herein as a "non-endogenous, constitutively activated receptor." Both terms can be utilized to describe both "in vivo" and "in vitro" systems. For



-11-

example, and not a limitation, in a screening approach, the endogenous or non-endogenous receptor may be in reference to an in vitro screening system. As a further example and not limitation, where the genome of a mammal has been manipulated to include a non-endogenous constitutively activated receptor, screening of a candidate compound by means of an in vivo system is viable.

- 5 [0051] INHIBIT or INHIBITING, in relationship to the term “response” shall mean that a response is decreased or prevented in the presence of a compound as opposed to in the absence of the compound.

- [0052] INVERSE AGONISTS shall mean moieties that bind the endogenous form of the receptor or to the constitutively activated form of the receptor, and which inhibit the baseline intracellular  
10 response initiated by the active form of the receptor below the normal base level of activity which is observed in the absence of agonists or partial agonists, or decrease GTP binding to membranes. Preferably, the baseline intracellular response is inhibited in the presence of the inverse agonist by at least 30%, more preferably by at least 50%, and most preferably by at least 75%, as compared with the baseline response in the absence of the inverse agonist.

- 15 [0053] LIGAND shall mean an endogenous, naturally occurring molecule specific for an endogenous, naturally occurring receptor.

- [0054] As used herein, the terms MODULATE or MODULATING shall mean to refer to an increase or decrease in the amount, quality, response or effect of a particular activity, function or molecule. For example, Compounds which modulate/capable of modulating the 5-HT<sub>2A</sub> activity  
20 include agonists, inverse agonists, antagonists, inhibitors, activators, and compounds which directly or indirectly affect regulation of the 5-HT<sub>2A</sub> activity.

- [0055] PHARMACEUTICAL COMPOSITION shall mean a composition comprising at least one active ingredient, whereby the composition is amenable to investigation for a specified, efficacious outcome in a mammal (for example, and not limitation, a human). Those of ordinary skill in the art will  
25 understand and appreciate the techniques appropriate for determining whether an active ingredient has a desired efficacious outcome based upon the needs of the artisan.

- [0056] STIMULATE or STIMULATING, in relationship to the term “response” shall mean that a response is increased in the presence of a compound as opposed to in the absence of the compound.

## DETAILED DESCRIPTION

[0057] In addition to the foregoing beneficial uses for the modulators of 5-HT<sub>2A</sub> receptor activity disclosed herein, the compounds disclosed herein are believed to be useful in the treatment of several additional diseases and disorders, and in the amelioration of symptoms thereof. Without limitation, these include the following:

### USE OF THE COMPOUNDS OF THE INVENTION

#### 1. Antiplatelet Therapies (5-HT<sub>2A</sub> mediated platelet aggregation):

10 [0058] Antiplatelet agents (antiplatelets) are prescribed for a variety of conditions. For example, in coronary artery disease they are used to help prevent myocardial infarction or stroke in patients who are at risk of developing obstructive blood clots (e.g., coronary thrombosis).

[0059] In a myocardial infarction (heart attack), the heart muscle does not receive enough oxygen-rich blood as a result of a blockage in the coronary blood vessels. If taken while an attack is in progress or immediately afterward (preferably within 30 minutes), antiplatelets can reduce the damage to the heart.

[0060] A transient ischemic attack ("TIA" or "mini-stroke") is a brief interruption of oxygen flow to the brain due to decreased blood flow through arteries, usually due to an obstructing blood clot. Antiplatelet drugs have been found to be effective in preventing TIAs.

20 [0061] Angina is a temporary and often recurring chest pain, pressure or discomfort caused by inadequate oxygen-rich blood flow (ischemia) to some parts of the heart. In patients with angina, antiplatelet therapy can reduce the effects of angina and the risk of myocardial infarction.

[0062] Stroke is an event in which the brain does not receive enough oxygen-rich blood, usually due to blockage of a cerebral blood vessel by a blood clot. In high-risk patients, taking antiplatelets regularly has been found to prevent the formation blood clots that cause first or second strokes.

[0063] Angioplasty is a catheter based technique used to open arteries obstructed by a blood clot. Whether or not stenting is performed immediately after this procedure to keep the artery open, antiplatelets can reduce the risk of forming additional blood clots following the procedure(s).

-13-

**[0064]** Coronary bypass surgery is a surgical procedure in which an artery or vein is taken from elsewhere in the body and grafted to a blocked coronary artery, rerouting blood around the blockage and through the newly attached vessel. After the procedure, antiplatelets can reduce the risk of secondary blood clots.

5 **[0065]** Atrial fibrillation is the most common type of sustained irregular heart rhythm (arrhythmia). Atrial fibrillation affects about two million Americans every year. In atrial fibrillation, the atria (the heart's upper chambers) rapidly fire electrical signals that cause them to quiver rather than contract normally. The result is an abnormally fast and highly irregular heartbeat. When given after an episode of atrial fibrillation, antiplatelets can reduce the risk of blood clots forming in the  
10 heart and traveling to the brain (embolism).

**[0066]** 5-HT<sub>2A</sub> receptors are expressed on smooth muscle of blood vessels and 5-HT secreted by activated platelets causes vasoconstriction as well as activation of additional platelets during clotting. There is evidence that a 5-HT<sub>2A</sub> inverse agonist will inhibit platelet aggregation and thus be a potential treatment as an antiplatelet therapy. See Satimura, K, et al., Clin Cardiol 2002 Jan. 25  
15 (1):28-32; and Wilson, H.C et al., Thromb Haemost 1991 Sep 2;66(3):355-60.

**[0067]** The 5-HT<sub>2A</sub> inverse agonists disclosed herein provide beneficial improvement in microcirculation to patients in need of antiplatelet therapy by antagonizing the vasoconstrictive products of the aggregating platelets in, for example and not limitation, the indications described above. Accordingly, in some embodiments, the present invention provides methods for reducing  
20 platelet aggregation in a patient in need thereof comprising administering to said patient a composition comprising a 5-HT<sub>2A</sub> inverse agonist disclosed herein. In further embodiments, the present invention provides methods for treating coronary artery disease, myocardial infarction, transient ischemic attack, angina, stroke, atrial fibrillation, or a symptom of any of the foregoing in a patient in need of said treatment, comprising administering to said patient a composition comprising a  
25 5-HT<sub>2A</sub> inverse agonist disclosed herein.

**[0068]** In further embodiments, the present invention provides methods for reducing risk of blood clot formation in a angioplasty or coronary bypass surgery patient, or a patient suffering from atrial fibrillation, comprising administering to a said patient a composition comprising a 5-HT<sub>2A</sub> inverse agonist disclosed herein at a time where such risk exists.

## 30 **2. Asthma**

**[0069]** It has been suggested that 5-HT (5-hydroxytryptamine) plays a role in the pathophysiology of acute asthma. See Cazzola, M. and Matera, M.G., TIPS, 2000, 21, 13; and De

-14-

Bie, J.J. et al., British J. Pharm., 1998, 124, 857-864. The compounds of the present invention disclosed herein are useful in the treatment of asthma, and the treatment of the symptoms thereof. Accordingly, in some embodiments, the present invention provides methods for treating asthma in a patient in need of said treatment, comprising administering to said patient a composition comprising a  
5 5-HT<sub>2A</sub> inverse agonist disclosed herein. In further embodiments, methods are provided for treating a symptom of asthma in a patient in need of said treatment, comprising administering to said patient a composition comprising a 5-HT<sub>2A</sub> inverse agonist disclosed herein.

### 3. Agitation

[0070] Agitation is a well-recognized behavioral syndrome with a range of symptoms,  
10 including hostility, extreme excitement, poor impulse control, tension and uncooperativeness (See Cohen-Mansfield J, and Billig, N., (1986), Agitated Behaviors in the Elderly. I. A Conceptual Review. J Am Geriatr Soc 34(10): 711-721).

[0071] Agitation is a common occurrence in the elderly and often associated with dementia such as those caused by Alzheimer's disease, Lewy Body, Parkinson's, and Huntington's, which are  
15 degenerative diseases of the nervous system and by diseases that affect blood vessels, such as stroke, or multi-infarct dementia, which is caused by multiple strokes in the brain can also induce dementia. Alzheimer's disease accounts for approximately 50 to 70% of all dementias (See Koss E, et al., (1997), Assessing patterns of agitation in Alzheimer's disease patients with the Cohen-Mansfield Agitation Inventory. The Alzheimer's Disease Cooperative Study. Alzheimer Dis Assoc Disord  
20 11(suppl 2):S45-S50).

[0072] An estimated five percent of people aged 65 and older and up to 20 percent of those aged 80 and older are affected by dementia. Of these sufferers, nearly half exhibit behavioral disturbances, such as agitation, wandering and violent outbursts.

[0073] Agitated behaviors can also be manifested in cognitively intact elderly people and by  
25 those with psychiatric disorders other than dementia

[0074] Agitation is often treated with antipsychotic medications such as haloperidol in nursing home and other assisted care settings. There is emerging evidence that agents acting at the 5-HT<sub>2A</sub> receptors in the brain have the effects of reducing agitation in patients, including Alzheimer's dementia (See Katz, I.R., et al., J Clin Psychiatry 1999 Feb., 60(2):107-115; and Street, J.S., et al.,  
30 Arch Gen Psychiatry 2000 Oct., 57(10):968-976).

-15-

[0075] The compounds of the invention disclosed herein are useful for treating agitation and symptoms thereof. Thus, in some embodiments, the present invention provides methods for treating agitation in a patient in need of such treatment comprising administering to said patient a composition comprising a 5-HT<sub>2A</sub> inverse agonist disclosed herein. In some embodiments, the agitation is due to a psychiatric disorder other than dementia. In some embodiments, the present invention provides methods for treatment of agitation or a symptom thereof in a patient suffering from dementia comprising administering to said patient a composition comprising a 5-HT<sub>2A</sub> inverse agonist disclosed herein. In some embodiments of such methods, the dementia is due to a degenerative disease of the nervous system, for example and without limitation, Alzheimers disease, Lewy Body, Parkinson's disease, and Huntington's disease, or dementia due to diseases that affect blood vessels, including without limitation stroke and multi-infarct dementia. In some embodiments, methods are provided for treating agitation or a symptom thereof in a patient in need of such treatment, where the patient is a cognitively intact elderly patient, comprising administering to said patient a composition comprising a 5-HT<sub>2A</sub> inverse agonist disclosed herein.

#### 4. Add-on therapy to Haloperidol in the treatment of schizophrenia and other disorders:

[0076] Schizophrenia is a psychopathic disorder of unknown origin, which usually appears for the first time in early adulthood and is marked by a number of characteristics, psychotic symptoms, progression, phasic development and deterioration in social behavior and professional capability in the region below the highest level ever attained. Characteristic psychotic symptoms are disorders of thought content (multiple, fragmentary, incoherent, implausible or simply delusional contents or ideas of persecution) and of mentality (loss of association, flight of imagination, incoherence up to incomprehensibility), as well as disorders of perceptibility (hallucinations), of emotions (superficial or inadequate emotions), of self-perception, of intentions and impulses, of interhuman relationships, and finally psychomotoric disorders (such as catatonia). Other symptoms are also associated with this disorder. (See, American Statistical and Diagnostic Handbook).

[0077] Haloperidol (Haldol) is a potent dopamine D2 receptor antagonist. It is widely prescribed for acute schizophrenic symptoms, and is very effective for the positive symptoms of schizophrenia. However, Haldol is not effective for the negative symptoms of schizophrenia and may actually induce negative symptoms as well as cognitive dysfunction. In accordance with some methods of the invention, adding a 5-HT<sub>2A</sub> inverse agonist concomitantly with Haldol will provide benefits including the ability to use a lower dose of Haldol without losing its effects on positive symptoms, while reducing or eliminating its inductive effects on negative symptoms, and prolonging relapse to the patient's next schizophrenic event.

-16-

[0078] Haloperidol is used for treatment of a variety of behavioral disorders, drug induced psychosis, excitative psychosis, Gilles de la Tourette's syndrome, manic disorders, psychosis (organic and NOS), psychotic disorder, psychosis, schizophrenia (acute, chronic and NOS). Further uses include in the treatment of infantile autism, huntington's chorea, and nausea and vomiting from chemotherapy and chemotherapeutic antibodies. Administration of 5-HT<sub>2A</sub> inverse agonists disclosed herein with haloperidol also will provide benefits in these indications.

[0079] In some embodiments, the present invention provides methods for treating a behavioral disorder, drug induced psychosis, excitative psychosis, Gilles de la Tourette's syndrome, manic disorders, psychosis (organic and NOS), psychotic disorder, psychosis, schizophrenia (acute, chronic and NOS) comprising administering to said patient a dopamine D2 receptor antagonist and a 5-HT<sub>2A</sub> inverse agonist disclosed herein.

[0080] In some embodiments, the present invention provides methods for treating a behavioral disorder, drug induced psychosis, excitative psychosis, Gilles de la Tourette's syndrome, manic disorders, psychosis (organic and NOS), psychotic disorder, psychosis, schizophrenia (acute, chronic and NOS) comprising administering to said patient haloperidol and a 5-HT<sub>2A</sub> inverse agonist disclosed herein.

[0081] In some embodiments, the present invention provides methods for treating infantile autism, huntington's chorea, or nausea and vomiting from chemotherapy or chemotherapeutic antibodies comprising administering to said patient a dopamine D2 receptor antagonist and a 5-HT<sub>2A</sub> inverse agonist disclosed herein.

[0082] In some embodiments, the present invention provides methods for treating infantile autism, huntington's chorea, or nausea and vomiting from chemotherapy or chemotherapeutic antibodies comprising administering to said patient haloperidol and a 5-HT<sub>2A</sub> inverse agonist disclosed herein.

[0083] In further embodiments, the present invention provides methods for treating schizophrenia in a patient in need of said treatment comprising administering to said patient a dopamine D2 receptor antagonist and a 5-HT<sub>2A</sub> inverse agonist disclosed herein. Preferably, the dopamine D2 receptor antagonist is haloperidol.

[0084] The administration of the dopamine D2 receptor antagonist can be concomitant with administration of the 5-HT<sub>2A</sub> inverse agonist, or they can be administered at different times. Those of skill in the art will easily be able to determine appropriate dosing regimes for the most efficacious

-17-

reduction or elimination of deleterious haloperidol effects. In some embodiments, haloperidol and the 5-HT<sub>2A</sub> inverse agonist are administered in a single dosage form, and in other embodiments, they are administered in separate dosage forms.

[0085] The present invention further provides methods of alleviating negative symptoms of schizophrenia induced by the administration of haloperidol to a patient suffering from said schizophrenia, comprising administering to said patient a 5-HT<sub>2A</sub> inverse agonist as disclosed herein.

#### PARTICULARLY PREFERRED MUTATIONS

[0086] For convenience, the sequence information regarding the non-endogenous, constitutively active human 5-HT<sub>2A</sub> and 5-HT<sub>2C</sub> receptors are referred to by identifiers as set forth in TABLE 2:

TABLE 2

IDENTIFIER	RECEPTOR	SEQ.ID.NO.:	FIGURE
AP-1 cDNA	5-HT <sub>2C</sub>	28	5a
AP-1	5-HT <sub>2C</sub>	29	5b
AP-3 cDNA	5-HT <sub>2A</sub>	30	6a
AP-3	5-HT <sub>2A</sub>	31	6b
AP-4 cDNA	5-HT <sub>2A</sub>	32	7a
AP-4	5-HT <sub>2A</sub>	33	7b

As will be discussed in greater detail below, a mutation analogous to that reported by Casey (C322K) was utilized in the human 5-HT<sub>2A</sub> receptor and is referred to herein as AP-2. However, AP-2 did not lead to sufficient constitutive activation to allow for utilization in screening techniques.

#### INTRODUCTION

[0087] While it is sometimes possible to make predictions as to the effect of nucleic acid manipulation from one species to another, this is not always the case. The results reported by Casey suggest that a point mutation in the rat 5-HT<sub>2A</sub> receptor evidences constitutive activation of the mutated receptor. Casey reports that the C322K mutation was approximately four fold more active than the native rat 5-HT<sub>2A</sub> receptor. However, for purposes of a most preferred use, i.e., screening of candidate compounds, this corresponding mutation in the human 5-HT<sub>2A</sub> receptor had little

-18-

discernable effect in evidencing constitutive activation of the human receptor. This, of course, creates the reasonable conclusion that the information reported in Herrick-Davis 1 or Herrick-Davis 2 is of limited predictive value relative to the manipulation of the human 5-HT<sub>2C</sub> receptor. Consequently, the ability to make reasonable predictions about the effects of mutations to the rat 5-HT receptors vis-à-vis the corresponding human receptors is not possible. Nonetheless, this unfortunate lack of reasonable predictability provides the opportunity for others to discover mutations to the human 5-HT receptors that provide evidence of constitutive activation.

[0088] Therefore, the present invention is based upon the desire of defining mutated sequences of the human serotonin receptors 5-HT<sub>2A</sub> and 5-HT<sub>2C</sub> whereby such mutated versions of the expressed receptor are constitutively active. These constitutively active receptors allow for, inter alia, screening candidate compounds.

[0089] What has been discovered and disclosed herein is that substantial activation of the human 5-HT<sub>2A</sub> receptor can be obtained by "domain swapping," i.e., by switching the third intracellular domain of the 5-HT<sub>2A</sub> receptor with the third intracellular domain of the 5-HT<sub>2C</sub> receptor. Additionally, swapping the cytoplasmic tail of the two receptors further increases the IP<sub>3</sub> response. Furthermore, mutation of the serine at position 310 to lysine (S31OK) of the human 5-HT<sub>2C</sub> receptor leads to constitutive activation.

[0090] What follows is a most preferred approach to identification of candidate compounds; those in the art will readily appreciate that the particular order of screening approaches, and/or whether or not to utilize certain of these approaches, is a matter of choice. Thus, the order presented below, set for presentational efficiency and for indication of the most preferred approach utilized in screening candidate compounds, is not intended, nor is to be construed, as a limitation on the disclosure, or any claims to follow.

## **GENERIC G PROTEIN-COUPLED RECEPTOR SCREENING ASSAY TECHNIQUES**

[0091] When a G protein receptor becomes constitutively active, it binds to a G protein (Gq, Gs, Gi, Go) and stimulates the binding of GTP to the G protein. The G protein then acts as a GTPase and slowly hydrolyzes the GTP to GDP, whereby the receptor, under normal conditions, becomes deactivated. However, constitutively activated receptors continue to exchange GDP to GTP. A non-hydrolyzable analog of GTP, (<sup>35</sup>S)GTPγS, can be used to monitor enhanced binding to membranes which express constitutively activated receptors. It is reported that (<sup>35</sup>S)GTPγS can be used to monitor G protein coupling to membranes in the absence and presence of ligand. An example of this monitoring, among



-19-

other examples well-known and available to those in the art, was reported by Traynor and Nahorski in 1995. The preferred use of this assay system is for initial screening of candidate compounds because the system is generically applicable to all G protein-coupled receptors regardless of the particular G protein that interacts with the intracellular domain of the receptor. .

5

#### **CONFIRMATION OF G PROTEIN-COUPLED RECEPTOR SITE SCREENING ASSAY TECHNIQUES**

[0092] Once candidate compounds are identified using the “generic” G protein-coupled receptor assay (*i.e.* an assay to select compounds that are agonists, partial agonists, or inverse agonists), further screening to confirm that the compounds have interacted at the receptor site is preferred. For example, a compound identified by the “generic” assay may not bind to the receptor, but may instead merely “uncouple” the G protein from the intracellular domain. Thus, by further screening those candidate compounds, which have been identified using a “generic” assay in an agonist and/or antagonist competitive binding assay, further refinement in the selection process is provided.

[0093] Lysergic acid diethylamide (LSD) is a well-known agonist of the 5-HT<sub>2A</sub> and 5-HT<sub>2C</sub> receptors, while mesulergine is a well-known antagonist to the 5-HT<sub>2C</sub> receptor. Accordingly, in most preferred embodiments, an agonist (LSD) and/or antagonist (mesulergine) competitive binding assay(s) is used to further screen those compounds selected from the “generic” assay for confirmation of serotonin receptor binding.

20

#### **SPECIFIED G PROTEIN ASSAY TECHNIQUES**

[0094] The art-accepted physiologically mediated pathway for the human 5-HT<sub>2A</sub> and 5-HT<sub>2C</sub> receptors is via Gq. Intracellular accumulation of IP3 can be used to confirm constitutive activation of these types of Gq coupled receptors (see Herrick-Davis-1). As a result, “IP3 accumulation” assays can be used to further screen those compounds selected from an agonist and/or antagonist competitive binding assay. .

25

#### **PHARMACEUTICAL COMPOSITIONS**

[0095] Candidate compounds selected for further development can be formulated into pharmaceutical compositions using techniques well known to those in the art. Suitable pharmaceutically-

30

-20-

acceptable carriers are available to those in the art; for example, see Remington's Pharmaceutical Sciences, 16<sup>th</sup> Edition, 1980, Mack Publishing Co., (Oslo et al., eds.).

## EXAMPLES

- 5    **[0096]**       The following examples are presented for purposes of elucidation, and not limitation, of the present invention. While specific nucleic acid and amino acid sequences are disclosed herein, those of ordinary skill in the art are credited with the ability to make minor modifications to these sequences while achieving the same or substantially similar results reported below. It is intended that equivalent, non-endogenous, constitutively activated human serotonin receptor sequences include  
10 those having eighty-five percent (85%) homology, more preferably having ninety percent (90%) homology, and most preferably having ninety-five percent (95%) homology to the disclosed and claimed sequences all fall within the scope of any claims appended hereto.

### EXAMPLE 1

15    **GENERATION OF NON-ENDOGENOUS, CONSTITUTIVELY ACTIVATED  
HUMAN SEROTONIN RECEPTORS 5-HT<sub>2C</sub> AND 5-HT<sub>2A</sub>**

**A.       Construction of constitutively active 5-HT<sub>2C</sub> receptor cDNA**

**1.       Endogenous Human 5-HT<sub>2C</sub>**

- 20    **[0097]**       The cDNA encoding endogenous human 5-HT<sub>2C</sub> receptor was obtained from human brain poly-A<sup>+</sup> RNA by RT-PCR. The 5' and 3' primers were derived from the 5' and 3' untranslated regions and contained the following sequences: .

5'-GACCTCGAGGTTGCTTAAGACTGAAGCA-3' (**SEQ.ID.NO.:1**)

5'-ATTTCTAGACATATGTAGCTTGTACCGT-3' (**SEQ.ID.NO.:2**)

- 25    PCR was performed using either TaqPlus<sup>TM</sup> precision polymerase (Stratagene) or rTth<sup>TM</sup> polymerase (Perkin Elmer) with the buffer systems provided by the manufacturers, 0.25 μM of each primer, and 0.2 mM of each of the four (4) nucleotides. The cycle condition was 30 cycles of 94°C for 1 minute, 57°C for 1 minute and 72°C for 2 minutes. The 1.5 kb PCR fragment was digested with Xho I and Xba I and subcloned into the Sal I-Xba I site of pBluescript.

- 30    **[0098]**       The derived cDNA clones were fully sequenced and found to correspond to published sequences.

-21-

## 2. AP-1 cDNA

[0099] The cDNA containing a S310K mutation (AP-1 cDNA) in the third intracellular loop of the human 5-HT<sub>2C</sub> receptor was constructed by replacing the Sty I restriction fragment containing amino acid 310 with synthetic double stranded oligonucleotides encoding the desired mutation. The sense strand sequence utilized had the following sequence:

5'-CTAGGGGCACCATGCAGGCTATCAACAATGAAAGAAAAGCTAAGAAAGTC-3'

(SEQ.ID.NO.:3)

and the antisense strand sequence utilized had the following sequence:

5'-CAAGGACTTTCTTAGCTTTTCTTTCATTGTTGATAGCCTGCATGGTGCCC-3'

(SEQ.ID.NO.:4).

## B. Construction of constitutively active 5-HT<sub>2A</sub> receptor cDNA

### 1. Endogenous Human 5-HT<sub>2A</sub>

[0100] The cDNA encoding endogenous human 5-HT<sub>2A</sub> receptor was obtained by RT-PCR using human brain poly-A<sup>+</sup> RNA; a 5' primer from the 5' untranslated region with a Xho I restriction site:

5'-GACCTCGAGTCCTTCTACACCTCATC-3' (SEQ.ID.NO.:5)

and a 3' primer from the 3' untranslated region containing an Xba I site:

5'-TGCTCTAGATTCCAGATAGGTGAAAA CTTG-3' (SEQ.ID.NO.:6).

PCR was performed using either TaqPlus<sup>TM</sup> precision polymerase (Stratagene) or rTth<sup>TM</sup> polymerase (Perkin Elmer) with the buffer systems provided by the manufacturers, 0.25 μM of each primer, and 0.2 mM of each of the four (4) nucleotides. The cycle condition was 30 cycles of 94°C for 1 minute, 57°C for 1 minute, and 72 °C for 2 minutes. The 1.5 kb PCR fragment was digested with Xba I and subcloned into the Eco RV-Xba I site of pBluescript.

[0101] The resulting cDNA clones were fully sequenced and found to encode two amino acid changes from the published sequences. The first change is a T25N mutation in the N-terminal extracellular domain and the second change is an H452Y mutation. These mutations are likely to represent sequence polymorphisms rather than PCR errors since the cDNA clones having the same two mutations were derived from two independent PCR procedures using Taq polymerase from two different commercial sources (TaqPlus<sup>TM</sup> Stratagene and rTth<sup>TM</sup> Perkin Elmer).

### 2. Human 5-HT<sub>2A</sub> (C322K; AP-2)

[0102] The cDNA containing the point mutation C322K in the third intracellular loop was constructed by using the Sph I restriction enzyme site, which encompasses amino acid 322. For the PCR procedure, a primer containing the C322K mutation:

-22-

**5'-CAAAGAAAGTACTGGGCATCGTCTTCTTCCT-3' (SEQ.ID.NO.:7)**

was used along with the primer from the 3' untranslated region set forth above as **SEQ.ID.NO.:6**. The resulting PCR fragment was then used to replace the 3' end of the wild type 5-HT<sub>2A</sub> cDNA by the T4 polymerase blunted Sph I site. PCR was performed using pfu polymerase (Stratagene) with the buffer system provided by the manufacturer and 10% DMSO, 0.25 mM of each primer, 0.5mM of each of the 4 nucleotides. The cycle conditions were 25 cycles of 94°C for 1 minute, 60°C for 1 minute, and 72°C for 1 minute.

**3. AP-3 cDNA**

**[0103]** The human 5-HT<sub>2A</sub> cDNA with intracellular loop 3 (IC3) or IC3 and cytoplasmic tail replaced by the corresponding human 5-HT<sub>2C</sub> cDNA was constructed using PCR-based mutagenesis.

**(a) Replacement of IC3 Loop**

**[0104]** The IC3 loop of human 5-HT<sub>2A</sub> cDNA was first replaced with the corresponding human 5-HT<sub>2C</sub> cDNA. Two separate PCR procedures were performed to generate the two fragments, Fragment A and Fragment B, that fuse the 5-HT<sub>2C</sub> IC3 loop to the transmembrane 6 (TM6) of 5-HT<sub>2A</sub>. The 237 bp PCR fragment, Fragment A, containing 5-HT<sub>2C</sub> IC3 and the initial 13 bp of 5-HT<sub>2A</sub> TM6 was amplified by using the following primers:

5'-CCGCTCGAGTACTGCGCCGACAAGCTTTGAT-3' (**SEQ.ID.NO.:8**)

5'-CGATGCCCAGCACTTTCGAAGCTTTTCTTTCATTGTTG-3' (**SEQ.ID.NO.:9**)

The template used was human 5-HT<sub>2C</sub> cDNA.

**[0105]** The 529 bp PCR fragment, Fragment B, containing the C-terminal 13 bp of IC3 from 5-HT<sub>2C</sub> and the C-terminal of 5-HT<sub>2A</sub> starting at beginning of TM6, was amplified by using the following primers:

5'-AAAAGCTTCGAAAGTGCTGGGCATCGTCTTCTTCCT-3' (**SEQ.ID.NO.:10**)

5'-TGCTCTAGATTCCAGATAGGTGAAACTTG-3' (**SEQ.ID.NO.:11**)

The template used was human 5-HT<sub>2A</sub> cDNA.

**[0106]** Second round PCR was performed using Fragment A and Fragment B as co-templates with **SEQ.ID.NO.:8** and **SEQ.ID.NO.:11** (it is noted that the sequences for **SEQ.ID.NOS.:6** and **11** are the same) as primers. The resulting 740 bp PCR fragment, Fragment C, contained the IC3 loop of human 5-HT<sub>2C</sub> fused to TM6 through the end of the cytoplasmic tail of human 5-HT<sub>2A</sub>. PCR was performed using pfu<sup>TM</sup> polymerase (Stratagene) with the buffer system provided by the manufacturer, and 10% DMSO, 0.25 mM of each primer, and 0.5 mM of each of the four (4) nucleotides. The cycle conditions were 25 cycles of 94 °C for 1 minute, 57 °C (1st round PCR) or 60 °C (2nd round PCR) for 1 minute, and 72 °C for 1 minute (1st round PCR) or 90 seconds (2nd round PCR).

-23-

[0107] To generate a PCR fragment containing a fusion junction between the human 5-HT<sub>2A</sub> TM5 and the IC3 loop of 5-HT<sub>2C</sub>, four (4) primers were used. The two external primers, derived from human 5-HT<sub>2A</sub>, had the following sequences:

5'-CGTGTCTCTCCTTACTTCA-3' (SEQ.ID.NO.:12)

5 [0108] The other primer used was SEQ.ID.NO.:6 (see note above regarding SEQ.ID.NOS.:6 and 11). The first internal primer utilized was an antisense strand containing the initial 13 bp of IC3 of 5-HT<sub>2C</sub> followed by the terminal 23 bp derived from TM5 of 5-HT<sub>2A</sub>:

5'-TCGGCGCAGTACTTTGATAGTTAGAAAGTAGGTGAT-3' (SEQ.ID.NO.:13)

[0109] The second internal primer was a sense strand containing the terminal 14 bp derived from TM5 of 5-HT<sub>2A</sub> followed by the initial 24 bp derived from IC3 of 5-HT<sub>2C</sub>:

5'-TTCTAACTATCAAAGTACTGCGCCGACAAGCTTTGATG-3' (SEQ.ID.NO.:14).

[0110] PCR was performed using endogenous human 5-HT<sub>2A</sub> and a co-template, Fragment C, in a 50 ml reaction volume containing 1X pfu buffer, 10% DMSO, 0.5 mM of each of the four (4) nucleotides, 0.25 mM of each external primer (SEQ.ID.NOS.:11 and 12), 0.06 mM of each internal primer (SEQ.ID.NOS.:13 and 14) and 1.9 units of pfu polymerase (Stratagene). The cycle conditions were 25 cycles of 94°C for 1 minute, 52°C for 1 minute, and 72 °C for 2 minutes and 10 seconds. The 1.3 kb PCR product was then gel purified and digested with Pst I and Eco RI. The resulting 1 kb PstI-Eco RI fragment was used to replace the corresponding fragment in the endogenous human 5-HT<sub>2A</sub> sequence to generate the mutant 5-HT<sub>2A</sub> sequence encoding the IC3 loop of 5-HT<sub>2C</sub>.

## 20 (b) Replacement of the cytoplasmic tail

[0111] To replace the cytoplasmic tail of 5-HT<sub>2A</sub> with that of 5-HT<sub>2C</sub>, PCR was performed using a sense primer containing the C-terminal 22 bp of TM7 of endogenous human 5-HT<sub>2A</sub> followed by the initial 21 bp of the cytoplasmic tail of endogenous human 5-HT<sub>2C</sub>:

5'-TTCAGCAGTCAACCCACTAGTCTATACTCTGTTCAACAAAATT-3' (SEQ.ID.NO.:15)

25 The antisense primer was derived from the 3' untranslated region of endogenous human 5-HT<sub>2C</sub>:

5'-ATTCTAGACATATGTAGCTTGTACCGT-3' (SEQ.ID.NO.:16).

[0112] The resulting PCR fragment, Fragment D, contained the last 22 bp of endogenous human 5-HT<sub>2A</sub> TM7 fused to the cytoplasmic tail of endogenous human 5-HT<sub>2C</sub>. Second round PCR was performed using Fragment D and the co-template was endogenous human 5-HT<sub>2A</sub> that was previously digested with Acc I to avoid undesired amplification. The antisense primer used was SEQ.ID.NO.:16 (the sequences for SEQ.ID.NOS.:16 and 2 are the same) and the sense primer used was derived from endogenous human 5-HT<sub>2A</sub>:

5'-ATCACCTACTTTCTAACTA-3' (SEQ.ID.NO.:17).

[0113] PCR conditions were as set forth in Example 1B3(a) for the first round PCR, except that the annealing temperature was 48 °C and the extension time was 90 seconds. The resulting 710 bp PCR product was digested with Apa I and Xba I and used to replace the corresponding Apa I-Xba I fragment of either (a) endogenous human 5-HT<sub>2A</sub>, or (b) 5-HT<sub>2A</sub> with 2C IC3 to generate (a) endogenous human 5-HT<sub>2A</sub> with endogenous human 5-HT<sub>2C</sub> cytoplasmic tail and (b) AP-3, respectively.

#### 4. AP-4 cDNA

[0114] This mutant was created by replacement of the region of endogenous human 5-HT<sub>2A</sub> from amino acid 247, the middle of TM5 right after Pro<sup>246</sup>, to amino acid 337, the middle of TM6 just before Pro<sup>338</sup>, by the corresponding region of AP-1 cDNA. For convenience, the junction in TM5 is referred to as the "2A-2C junction," and the junction in TM6 is referred to as the "2C-2A junction."

[0115] Three PCR fragments containing the desired hybrid junctions were generated. The 5' fragment of 561 bp containing the 2A-2C junction in TM5 was generated by PCR using endogenous human 5-HT<sub>2A</sub> as template, SEQ.ID.NO.:12 as the sense primer, and the antisense primer was derived from 13 bp of 5-HT<sub>2C</sub> followed by 20 bp of 5-HT<sub>2A</sub> sequence:

5'-CCATAATCGTCAGGGGAATGAAAAATGACACAA-3' (SEQ.ID.NO.:18)

[0116] The middle fragment of the 323 bp contains endogenous human 5-HT<sub>2C</sub> sequence derived from the middle of TM5 to the middle of TM6, flanked by 13 bp of 5-HT<sub>2A</sub> sequences from the 2A-2C junction and the 2C-2A junction. This middle fragment was generated by using AP-1 cDNA as a template, a sense primer containing 13 bp of 5-HT<sub>2A</sub> followed by 20 bp of 5-HT<sub>2C</sub> sequences across the 2A-2C junction and having the sequence:

5'-ATTTTTCATTCCCCTGACGATTATGGTGATTAC-3' (SEQ.ID.NO.:19);

and an antisense primer containing 13 bp of 5-HT<sub>2A</sub> followed by 20 bp of 5-HT<sub>2C</sub> sequences across the 2C-2A junction and having the sequence:

5'-TGATGAAGAAAGGGCACCACATGATCAGAAACA-3' (SEQ.ID.NO.:20).

The 3' fragment of 487 bp containing the 2C-2A junction was generated by PCR using endogenous human 5-HT<sub>2A</sub> as a template and a sense primer having the following sequence from the 2C-2A junction:

5'-GATCATGTGGTGCCCTTCTTCATCACAACAT-3' (SEQ.ID.NO.:21)

and the antisense primer was SEQ.ID.NO.:6 (see note above regarding SEQ.ID.NOS.:6 and 11).

[0117] Two second round PCR reactions were performed separately to link the 5' and middle fragment (5'M PCR) and the middle and 3' fragment (M3' PCR). The 5'M PCR co-template used

-25-

was the 5' and middle PCR fragment as described above, the sense primer was SEQ.ID.NO.:12 and the antisense primer was SEQ.ID.NO.:20. The 5'M PCR procedure resulted in an 857 bp PCR fragment.

[0118] The M3' PCR used the middle and M3' PCR fragment described above as the co-  
5 template, SEQ.ID.NO.:19 as the sense primer and SEQ.ID.NO.:6 (see note above regarding  
SEQ.ID.NOS.:6 and 11) as the antisense primer, and generated a 784 bp amplification product. The  
final round of PCR was performed using the 857 bp and 784 bp fragments from the second round  
PCR as the co-template, and SEQ.ID.NO.:12 and SEQ.ID.NO.:6 (see note above regarding  
SEQ.ID.NOS.:6 and 11) as the sense and the antisense primer, respectively. The 1.32 kb  
10 amplification product from the final round of PCR was digested with Pst I and Eco RI. Then resulting  
1 kb Pst I-Eco RI fragment was used to replace the corresponding fragment of the endogenous human  
5-HT<sub>2A</sub> to generate mutant 5-HT<sub>2A</sub> with 5-HT<sub>2C</sub>: C310K/IC3. The Apa I-Xba fragment of AP3 was  
used to replace the corresponding fragment in mutant 5-HT<sub>2A</sub> with 5-HT<sub>2C</sub>: C310K/IC3 to generate  
AP4.

15

## EXAMPLE 2

### RECEPTOR EXPRESSION

#### A. pCMV

[0119] Although a variety of expression vectors are available to those in the art, for purposes  
20 of utilization for both the endogenous and non-endogenous receptors discussed herein, it is most  
preferred that the vector utilized be pCMV. This vector was deposited with the American Type  
Culture Collection (ATCC) on October 13, 1998 (10801 University Blvd., Manassas, VA 20110-2209  
USA) under the provisions of the Budapest Treaty for the International Recognition of the Deposit of  
Microorganisms for the Purpose of Patent Procedure. The DNA was tested by the ATCC and  
25 determined to be viable. The ATCC has assigned the following deposit number to pCMV: ATCC  
#203351. See Figure 8.

#### B. Transfection procedure

[0120] For the generic assay ((<sup>35</sup>S)GTPγS; Example 3) and the antagonist binding assay  
(mesulergine; Example 4), transfection of COS-7 or 293T cells was accomplished using the following  
30 protocol.

[0121] On day one, 5x10<sup>6</sup> COS-7 cells or 1x10<sup>7</sup> 293T cells per 150mm plate were plated out.  
On day two, two reaction tubes were prepared (the proportions to follow for each tube are per plate): tube  
A was prepared by mixing 20 μg DNA (e.g., pCMV vector; pCMV vector AP-1 cDNA, etc.) in 1.2 ml

-26-

serum free DMEM (Irvine Scientific, Irvine, CA); tube B was prepared by mixing 120  $\mu$ l lipofectamine (Gibco BRL) in 1.2 ml serum free DMEM. Tubes A and B were then admixed by inversions (several times), followed by incubation at room temperature for 30-45 min. The admixture is referred to as the "transfection mixture". Plated COS-7 cells were washed with 1X PBS, followed by addition of 10 ml serum free DMEM. 2.4 ml of the transfection mixture was then added to the cells, followed by incubation for 4 hrs at 37°C/5% CO<sub>2</sub>. The transfection mixture was then removed by aspiration, followed by the addition of 25 ml of DMEM/10% Fetal Bovine Serum. Cells were then incubated at 37°C/5% CO<sub>2</sub>. After 72 hr incubation, cells were then harvested and utilized for analysis.

### 10 EXAMPLE 3

#### GTP MEMBRANE BINDING SCINTILLATION PROXIMITY ASSAY

[0122] The advantages of using (<sup>35</sup>S)GTP $\gamma$ S binding to measure constitutive activation are that: (a) (<sup>35</sup>S)GTP $\gamma$ S binding is generically applicable to all G protein-coupled receptors; and (b) (<sup>35</sup>S)GTP $\gamma$ S binding is proximal at the membrane surface, thereby making it less likely to pick-up molecules which affect the intracellular cascade. The assay utilizes the ability of G protein-coupled receptors to stimulate (<sup>35</sup>S)GTP $\gamma$ S binding to membranes expressing the relevant receptors. Therefore, the assay may be used to directly screen compounds at the disclosed serotonin receptors.

[0123] Figure 9 demonstrates the utility of a scintillation proximity assay to monitor the binding of (<sup>35</sup>S)GTP $\gamma$ S to membranes expressing, *e.g.*, the endogenous human 5-HT<sub>2C</sub> receptor expressed in COS cells. In brief, a preferred protocol for the assay is such that the assay was incubated in 20 mM HEPES, pH 7.4, binding buffer with 0.3 nM (<sup>35</sup>S)GTP $\gamma$ S and 12.5  $\mu$ g membrane protein and 1  $\mu$ M GDP for 30 minutes. Wheatgerm agglutinin beads (25  $\mu$ l; Amersham) were then added and the mixture was incubated for another 30 minutes at room temperature. The tubes were then centrifuged at 1500 x g for 5 minutes at room temperature and then counted in a scintillation counter. As shown in FIG. 9, serotonin, which as the endogenous ligand activates the 5-HT<sub>2C</sub> receptor, stimulated (<sup>35</sup>S)GTP $\gamma$ S binding to the membranes in a concentration dependant manner. The stimulated binding was completely inhibited by 30  $\mu$ M mianserin, a compound considered as a classical 5-HT<sub>2C</sub> antagonist, but also known as a 5-HT<sub>2C</sub> inverse agonist.

[0124] Although this assay measures agonist-induced binding of (<sup>35</sup>S)GTP $\gamma$ S to membranes and can be routinely used to measure constitutive activity of receptors, the present cost of wheatgerm agglutinin beads may be prohibitive. A less costly but equally applicable alternative also meets the needs of large-scale screening. Flash plates and Wallac<sup>TM</sup> scintistrips may be used to format a high throughput (<sup>35</sup>S)GTP $\gamma$ S binding assay. This technique allows one to monitor the tritiated ligand



-27-

binding to the receptor while simultaneously monitoring the efficacy via (<sup>35</sup>S)GTPγS binding. This is possible because the Wallac™ beta counter can switch energy windows to analyze both tritium and <sup>35</sup>S-labeled probes.

[0125] Also, this assay may be used for detecting of other types of membrane activation events that result in receptor activation. For example, the assay may be used to monitor <sup>32</sup>P phosphorylation of a variety of receptors (including G protein-coupled and tyrosine kinase receptors). When the membranes are centrifuged to the bottom of the well, the bound (<sup>35</sup>S)GTPγS or the <sup>32</sup>P-phosphorylated receptor will activate the scintillant coated on the wells. Use of Scinti® strips (Wallac™) demonstrate this principle. Additionally, this assay may be used for measuring ligand binding to receptors using radiolabeled ligands. In a similar manner, the radiolabeled bound ligand is centrifuged to the bottom of the well and activates the scintillant. The (<sup>35</sup>S)GTPγS assay results parallel the results obtained in traditional second messenger assays of receptors.

[0126] As shown in Figure 10, serotonin stimulates the binding of (<sup>35</sup>S)GTPγS to the endogenous human 5-HT<sub>2C</sub> receptor, while mianserin inhibits this response; furthermore, mianserin acts as a partial inverse agonist by inhibiting the basal constitutive binding of (<sup>35</sup>S)GTPγS to membranes expressing the endogenous human 5-HT<sub>2C</sub> receptor. As expected, there is no agonist response in the absence of GDP since there is no GDP present to exchange for (<sup>35</sup>S)GTPγS. Not only does this assay system demonstrate the response of the native 5-HT<sub>2C</sub> receptor, but it also measures the constitutive activation of other receptors.

[0127] Figure 11A and Figure 11B demonstrate the enhanced binding of (<sup>35</sup>S)GTPγS to membranes prepared from 293T cells expressing the control vector alone, the native human 5-HT<sub>2C</sub> receptor or the AP-1 receptor was observed (data not shown). The total protein concentration used in the assay affects the total amount of (<sup>35</sup>S)GTPγS binding for each receptor. The c.p.m. differential between the CMV transfected and the constitutively active mutant receptor increased from approximately 1000 c.p.m at 10 μg/well to approximately 6-8000 c.p.m. at 75 μg/well protein concentration, as shown in Figure 11.

[0128] The AP-1 receptor showed the highest level of constitutive activation followed by the wild type receptor, which also showed enhanced (<sup>35</sup>S)GTPγS binding above basal. This is consistent with the ability of the endogenous human 5-HT<sub>2C</sub> receptor to accumulate intracellular IP3 in the absence of 5-HT stimulation (Example 5) and is also consistent with published data claiming that the endogenous human 5-HT<sub>2C</sub> receptor has a high natural basal activity. Therefore, the AP-1 receptor

-28-

demonstrates that constitutive activity may be measured by proximal (<sup>35</sup>S)GTPγS binding events at the membrane interface.

#### **EXAMPLE 4**

##### **SEROTONIN RECEPTOR AGONIST/ANTAGONIST**

##### **5 COMPETITIVE BINDING ASSAY**

[0129] Membranes were prepared from transfected COS-7 cells (*see* Example 2) by homogenization in 20 mM HEPES and 10 mM EDTA, pH 7.4 and centrifuged at 49,000 x g for 15 min. The pellet was resuspended in 20 mM HEPES and 0.1 mM EDTA, pH 7.4, homogenized for 10 sec. using a Polytron homogenizer (Brinkman) at 5000 rpm and centrifuged at 49,000 x g for 15 min.  
10 The final pellet was resuspended in 20 mM HEPES and 10 mM MgCl<sub>2</sub>, pH 7.4, homogenized for 10 sec. using polytron homogenizer (Brinkman) at 5000 rpm.

[0130] Assays were performed in triplicate 200 μl volumes in 96 well plates. Assay buffer (20 mM HEPES and 10 mM MgCl<sub>2</sub>, pH 7.4) was used to dilute membranes, <sup>3</sup>H-LSD, <sup>3</sup>H-mesulergine, serotonin (used to define non-specific for LSD binding) and mianserin (used to define non-specific for  
15 mesulergine binding). Final assay concentrations consisted of 1 nM <sup>3</sup>H-LSD or 1 nM <sup>3</sup>H-mesulergine, 50 μg membrane protein and 100 μM serotonin or mianserin. LSD assays were incubated for 1 hr at 37° C, while mesulergine assays were incubated for 1 hr at room temperature. Assays were terminated by rapid filtration onto Wallac Filtermat Type B with ice cold binding buffer using Skatron cell harvester. The radioactivity was determined in a Wallac 1205 BetaPlate counter.

##### **20 EXAMPLE 5**

##### **INTRACELLULAR IP<sub>3</sub> ACCUMULATION ASSAY**

[0131] For the IP<sub>3</sub> accumulation assay, a transfection protocol different from the protocol set forth in Example 2 was utilized. In the following example, the protocols used for days 1-3 were slightly different for the data generated for Figures 12 and 14 and for Figures 13 and 15; the protocol  
25 for day 4 was the same for all conditions.

##### **A. COS-7 and 293 Cells**

[0132] On day one, COS-7 cells or 293 cells were plated onto 24 well plates, usually 1x10<sup>5</sup> cells/well or 2x10<sup>5</sup> cells/well, respectively. On day two, the cells were transfected by first mixing 0.25 μg DNA (*see* Example 2) in 50 μl serum-free DMEM/well and then 2 μl lipofectamine in 50 μl  
30 serum-free DMEM/well. The solutions ("transfection media") were gently mixed and incubated for 15-30 minutes at room temperature. The cells were washed with 0.5 ml PBS and then 400 μl of serum free media was mixed with the transfection media and added to the cells. The cells were then incubated for 3-4 hours at 37°C/5%CO<sub>2</sub>. Then the transfection media was removed and replaced with

-29-

1ml/well of regular growth media. On day 3, the media was removed and the cells were washed with 0.5 ml PBS. Then 0.5 ml inositol-free/serum-free media (GIBCO BRL) was added to each well with 0.25  $\mu$ Ci of  $^3$ H-myo-inositol/well and the cells were incubated for 16-18 hours overnight at 37°C/5% CO<sub>2</sub>. Protocol A.

5            **B.      293 Cells**

[0133]            On day one,  $1 \times 10^7$  293 cells per 150 mm plate were plated out. On day two, two reaction tubes were prepared (the proportions to follow for each tube are per plate): tube A was prepared by mixing 20  $\mu$ g DNA (e.g., pCMV vector; pCMV vector AP-1 cDNA, etc.) in 1.2 ml serum free DMEM (Irvine Scientific, Irvine, CA); tube B was prepared by mixing 120  $\mu$ l lipofectamine (Gibco BRL) in 1.2 ml serum free DMEM. Tubes A and B were then admixed by inversions (several times), followed by incubation at room temperature for 30-45 min. The admixture is referred to as the "transfection mixture". Plated 293 cells were washed with 1XPBS, followed by addition of 10ml serum free DMEM. 2.4 ml of the transfection mixture was then added to the cells, followed by incubation for 4 hrs at 37°C/5% CO<sub>2</sub>. On day 3, cells were trypsinized and counted, followed by plating of  $1 \times 10^6$  cells/well (poly D-lysine treated 12-well plates). Cells were permitted to adhere to the wells, followed by one wash with 1XPBS. Thereafter, 0.5  $\mu$ Ci  $^3$ H-inositol in 1ml inositol-free DMEM was added per well. Protocol B.

[0134]            On day 4, the cells were washed with 0.5 ml PBS and then 0.45 ml of assay medium was added containing inositol-free/serum free media, 10  $\mu$ M pargyline, 10 mM lithium chloride, or 0.4 ml of assay medium and 50  $\mu$ l of 10x ketanserin (ket) to a final concentration of 10  $\mu$ M. The cells were then incubated for 30 minutes at 37° C. Then the cells were washed with 0.5 ml PBS and 200  $\mu$ l of fresh/ice cold stop solution (1M KOH; 18 mM Na-borate; 3.8 mM EDTA) was added/well. The solution was kept on ice for 5-10 minutes or until the cells were lysed and then neutralized by 200  $\mu$ l of fresh/ice cold neutralization sol. (7.5 % HCL). The lysate was then transferred into 1.5 ml micro-centrifuge tubes and 1 ml of chloroform/methanol (1:2) was added/tube. The solution was vortexed for 15 seconds and the upper phase was applied to a Biorad AG1-X8 anion exchange resin ( 100-200 mesh). The resin was washed with water and 0.9 ml of the upper phase was loaded onto the column. The column was washed with 10 ml of 5 mM myo-inositol and 10 ml of 5 mM Na-borate/60mM Na-formate. The inositol trisphosphates were eluted into scintillation vials containing 10 ml of scintillation cocktail with 2 ml of 0.1 M formic acid/ 1 M ammonium formate. The columns were regenerated by washing with 10 ml of 0.1 M formic acid/3M ammonium formate and rinsed twice with dd H<sub>2</sub>O and stored at room temperature in water. Results are discussed below.

-30-

[0135] Figure 12 is an illustration of IP3 production from the human 5-HT<sub>2A</sub> receptor which was mutated using the same point mutation as set forth in Casey, which rendered the rat receptor constitutively active. The results represented in Figure 12, support the position that when the point mutation shown to activate the rat receptor is introduced into the human receptor, little activation of the receptor is obtained that would allow for appropriate screening of candidate compounds, with the response being only moderately above that of the endogenous human 5-HT<sub>2A</sub> receptor. Generally, a response of at least 2X above that of the endogenous response is preferred.

[0136] Figure 13 provides an illustration comparing IP3 production from endogenous 5-HT<sub>2A</sub> receptor and the AP4 mutation. The results illustrated in Figure 13 support the position that when the novel mutation disclosed herein is utilized, a robust response of constitutive IP3 accumulation is obtained (e.g., over 2X that of the endogenous receptor).

[0137] Figure 14 provides an illustration of IP3 production from AP3. The results illustrated in Figure 14 support the position that when the novel mutation disclosed herein is utilized, a robust response of constitutive IP3 accumulation is obtained.

[0138] Figure 15 provides bar-graph comparisons of IP3 accumulation between endogenous human 5-HT<sub>2C</sub> receptor and AP-1. Note that the endogenous receptor has a high degree of natural constitutive activity relative to the control CMV transfected cells (i.e., the endogenous receptor appears to be constitutively activated).

## Example 6

### Screening of Compounds Known to Have 5-HT<sub>2C</sub> Antagonist Activity Against Non-Endogenous, Constitutively Activated Human Serotonin Receptor: AP-1

[0139] A final concentration of 12.5 µg membranes prepared from COS7 cells (see Example 2) transiently expressing constitutively active mutant human 5-HT<sub>2C</sub> receptor AP-1 were incubated with binding buffer (20 mM HEPES, pH 7.4, 100 mM NaCl, 20 mM MgCl<sub>2</sub> · 6H<sub>2</sub>O, 0.2% saponin, and 0.2 mM ascorbate), GDP (1 µM) and compound in a 96-well plate format for a period of 60 minutes at ambient room temperature. Plates were then centrifuged at 4,000 rpm for 15 minutes followed by aspiration of the reaction mixture and counting for 1 minute in a Wallac<sup>TM</sup> MicroBeta plate scintillation counter. A series of compounds known to possess reported 5-HT<sub>2C</sub> antagonist activity were determined to be active in the (<sup>35</sup>S)GTPγS binding assay using AP-1. IC<sub>50</sub> determinations were made for these commercially available compounds (RBI, Natick, Mass.). Results are summarized in TABLE 3. For each determination, eight concentrations of test compounds were tested in triplicate.

-31-

The negative control in these experiments consisted of AP-1 receptor without test compound addition, and the positive control consisted of 12.5  $\mu\text{g}/\text{well}$  of COS7 cell membranes expressing the CMV promoter without expressed AP-1 receptor.

**TABLE 3**

Test Compound	Known Pharmacology	IC <sub>50</sub> (nM) in GTP- $\gamma$ -( <sup>35</sup> S) Assay
Metergoline	5-HT <sub>2</sub> /IC antagonist	32.0
Mesulergine	5-HT <sub>2</sub> /IC antagonist	21.2
Methysergide	5-HT <sub>2</sub> /IC antagonist	6.1
Methiothepin	5-HT <sub>1</sub> antagonist	20.4
Normethylclozapin	5-HT <sub>2</sub> /IC antagonist	21.4
Fluoxetine	5-HT reuptake inhibitor	114.0
Ritanserin	5-HT <sub>2</sub> /IC antagonist	19.4

5 The IC<sub>50</sub> results confirm that the seven tested compounds showed antagonist activity at the AP-1 receptor.

**EXAMPLE 7**

10 **SCREENING OF CANDIDATE COMPOUNDS AGAINST NON-ENDOGENOUS,  
CONSTITUTIVELY ACTIVATED HUMAN SEROTONIN RECEPTORS: AP-1**

[0140] Approximately 5,500 candidate compounds (Tripos, Inc., St. Louis, MO) were screened using the assay protocol of Example 3 (with AP-1 mutant receptor) for identification as inverse agonists against the receptor; for this assay, an arbitrary cut-off of at least 50% inhibition was established for identification of inverse agonists. Approximately 120 of these compounds evidenced at least 50% inhibition of (<sup>35</sup>S) GTP $\gamma$ S binding at 10  $\mu\text{M}$  candidate compound (data not shown).

**EXAMPLE 8**

20 **SCREENING OF SELECTED COMPOUNDS TO CONFIRM RECEPTOR BINDING: AP-1**

[0141] The candidate compounds identified from Example 7 were then screened using the assay protocol of Example 4 (mesulergine), using the AP-1 mutant receptor. IC<sub>50</sub> (nM) values were determined; five of the nearly 120 compounds of Example 7 were determined to have potent binding affinity for the receptor. Results are summarized in **TABLE 4**.

-32-

TABLE 4

Candidate Compound	IC <sub>50</sub> (nM) in Mesulergine Assay
Compound 3	205.0
Compound 4	46.5
Compound 5	209.0
Compound 6	147.0
Compound 7	1,810.0

**EXAMPLE 9A****GENERAL SCREENING PARADIGM: SELECTION OF PRE-CLINICAL CANDIDATE****5 LEADS**

[0142] The "primary" screen designed to directly identify human 5-HT<sub>2A</sub>/5-HT<sub>2C</sub> receptor inverse agonists consisted of a membrane-based GTPγS binding assay utilizing membranes prepared from COS7 cells transiently transfected with AP-1 human receptor. Candidate compounds (10μM final assay concentration) directly identified as inhibiting receptor-mediated increases in GTPγS binding by greater than 50-75% (arbitrary cut-off value) were considered active "hits". Primary assay hits were then re-tested in the same assay to reconfirm their inverse agonist activity. If primary assay hits were reconfirmed active (50% or greater inhibition), and therefore directly identified as, *e.g.*, an inverse agonist, one of two approaches were available: (a) so-called "directed libraries" could be created, *i.e.*, additional candidate compounds were synthesized based upon the structures of the reconfirmed hits (geared towards, *e.g.*, improvement in the characteristics of the compounds) whereby the directed library compounds were then evaluated for the ability to compete for radioligand binding to both mutant 5-HT<sub>2C</sub> (AP-1) and endogenous 5-HT<sub>2A</sub> receptors, or (b) the reconfirmed hits were then evaluated for the ability to compete for radioligand binding to both mutant 5-HT<sub>2C</sub> (AP-1) and endogenous 5-HT<sub>2A</sub> receptors. Thus, when approach (a) was used, because these directed library candidate compounds were based upon the structures of compounds that were directly identified from the membrane-based GTPγS binding assay, the directed library compounds were not re-tested in the membrane-based GTPγS binding assay but rather were then confirmed via the radioligand binding analysis. The radioligand binding analysis tests were initially performed at 10μM test compound in triplicate and if the compound inhibited radiolabeled binding by 50% or more, the analysis was followed by eight concentration competition curves to determine K<sub>i</sub> values. The last step in secondary assay evaluation was to determine if test compounds were capable of inhibiting AP-3 receptor-

-33-

mediated accumulation of inositol phosphates (e.g., IP<sub>3</sub>). This final assay confirms that the directly identified compounds retained inverse agonist properties.

#### Example 9B

#### 5    **CONSTITUTIVELY ACTIVATED HUMAN 5-HT<sub>2C</sub> RECEPTOR (AP-1) MEDIATED FACILITATION OF GTPγS BINDING TO COS7 MEMBRANES**

[0143]        This protocol is substantially the same as set forth above in Example 6. Primary screening assays measuring GTPγS binding to membranes prepared from COS7 cells transiently transfected with human mutated 5-HT<sub>2C</sub> receptor (AP-1) were used to directly identify inverse agonists in screening libraries (Tripos, Inc.). Candidate compound screens were performed in a total assay volume of 200 μl using scintillant-coated Wallac Scintistrip™ plates. The primary assay was comprised of the following chemicals (at indicated final assay concentrations): 20 mM HEPES, pH 7.4, 100 mM NaCl, 20 mM MgCl<sub>2</sub>, 0.2% saponin, 0.2 mM ascorbic acid, 1 μM GDP, 0.3 nM GTPγ<sup>35</sup>S, and 12.5 μg of the above defined membranes. Incubations were performed for 60 minutes at ambient room temperature. The binding assay incubation was terminated by centrifugation of assay plates at 4,000 rpm for 15 minutes, followed by rapid aspiration of the reaction mixture and counting in a Wallac MicroBeta™ scintillation counter.

[0144]        Primary screening of candidate compounds initially involved testing of 72 test compounds per assay plate (96-well plates were utilized), at a final assay concentration of 10 μM candidate compound, in single replicates. A total of sixteen wells of each plate were dedicated for an eight concentration clozapine (a confirmed 5-HT<sub>2C/2A</sub> inverse agonist) dose response curve (duplicate determinations at each concentration). Finally, a total of five assay wells of each plate were dedicated to define the negative control (AP-1 receptor expressing membranes without addition of candidate compounds) and three wells from each plate to define the positive control (membranes without AP-1 receptor).

[0145]        Reconfirmation experiments involve re-testing candidate compounds in the same assay described above, except that candidate compounds were evaluated in triplicate, thus allowing evaluation of 24 compounds per 96-well assay plate. Similar to the primary assay plates, an eight concentration clozapine dose response curve (duplicate determinations at each concentration) and the same negative and positive control wells were also included within each 96-well plate.

**Example 9C(1)****COMPETITION STUDIES FOR DIRECTLY IDENTIFIED COMPOUNDS:****MUTATED HUMAN 5-HT<sub>2C</sub> RECEPTOR (AP-1)**

[0146] Radioligand binding competition experiments were performed in a total assay volume of 200 µl using standard 96-well microtiter plates. The final assay ingredients consisted of assay buffer (20 mM HEPES and 10 mM MgCl<sub>2</sub>), 1nM (<sup>3</sup>H) mesulergine, and 50 µg of membranes (COS7 with AP-1 as defined above). Nonspecific (<sup>3</sup>H) mesulergine binding was defined in the presence of 100 µM mianserin. Incubations were performed for 1 hour at 37°C. Receptor bound radioligand was resolved from free radioligand by rapid filtration of the assay mixture over a Wallac Filtermat™ Type B filter, followed by washing with ice-cold assay buffer using a Skatron™ cell harvester. Radioactivity was counted using a Wallac 1205 BetaPlate™ counter. Each assay plate contained five negative control wells (membranes expressing receptor and no candidate compound addition) and three positive control wells (each containing 100 µM mianserin). For one concentration tests, candidate compounds were diluted into assay buffer and screened at a final concentration of 10 µM, in triplicate. For IC<sub>50</sub> determinations, candidate compounds were diluted in assay buffer and eight different concentrations were evaluated, in triplicate. A total of 16 wells were designated for an eight concentration mianserin dose response curve evaluation for both assays.

**EXAMPLE 9C(2)****COMPETITION STUDIES WILD TYPE HUMAN 5-HT<sub>2A</sub> RECEPTOR**

[0147] Radioligand binding competition experiments were performed in a total assay volume of 200 µl using standard 96-well microtiter plates. The final assay ingredients comprised assay buffer (20 mM HEPES and 10mM MgCl<sub>2</sub>), 1nM (<sup>3</sup>H)LSD, and 50 µg of the above-defined membranes (COS7 with AP-1). Nonspecific (<sup>3</sup>H)LSD binding was defined in the presence of 100 µM serotonin. Incubations were performed for 1 hour at 37° C. Receptor bound radioligand was resolved from free radioligand by rapid filtration of the assay mixture over a Wallac Filtermat™ Type B filter, followed by washing with ice-cold assay buffer using a Skatron™ cell harvester. Radioactivity was counted using a Wallac 1205 BetaPlate™ counter. Each assay plate contained five negative control wells (membranes expressing receptor and no candidate compound addition) and three positive control wells (containing 100 µM mianserin). For one concentration tests, candidate compounds were diluted into assay buffer and screened at a final concentration of 10 µM in triplicate. For IC<sub>50</sub> determinations, candidate compounds were diluted in assay buffer and eight different concentrations were evaluated in triplicate. A total of 16 wells were designated for an eight concentration serotonin dose response curve evaluation for both assays.



**EXAMPLE 9D****RECEPTOR-MEDIATED INOSITOL PHOSPHATE ACCUMULATION**

[0148] Candidate compound identified in the assays of Examples 9A-9C were then evaluated for inositol phosphate accumulation, following the protocol of Example 5 (COS7 cells expressing human mutated 5-HT<sub>2A</sub> receptor, AP-3), modified as follows: tube A was prepared by mixing 16 µg DNA (e.g., pCMV vector; pCMV vector AP-1 cDNA, etc.) in 1.0 ml serum free DMEM (Irvine Scientific, Irvine, CA); tube B was prepared by mixing 60 µl lipofectamine (Gibco BRL) in 1.0 ml serum free DMEM. Tubes A and B were then admixed by inversions (several times), followed by incubation at room temperature for 30 min. The admixture is referred to as the "transfection mixture". Plated 293 cells were washed with 10 ml Serum Free DMEM, followed by addition of 11 ml Serum Free DMEM. 2.0 ml of the transfection mixture was then added to the cells, followed by incubation for 5 hrs at 37° C/5% CO<sub>2</sub>. On day 3, cells were trypsinized and counted, followed by plating of 1x10<sup>6</sup> cells/well (12-well plates). Cells were permitted to adhere to the wells for 8 hrs, followed by one wash with 1xPBS. Thereafter, 0.5 µCi <sup>3</sup>H-inositol in 1ml inositol-free DMEM was added per well.

[0149] On day 4, the cells were washed with 1.5 ml PBS and then 0.9 ml of assay medium was added containing inositol-free/serum free media, 10 µM pargyline, 10 mM lithium chloride, for 5min in 37°C/5% CO<sub>2</sub> followed by 100µl addition of candidate compound diluted in the same material. The cells were then incubated for 120 minutes at 37° C. Then the cells were washed with 1.5 ml PBS and 200 µl of fresh/icecold stop solution (1M KOH; 18 mM Na-borate; 3.8 mM EDTA) was added/well. The solution was kept on ice for 5-10 minutes or until the cells were lysed and then neutralized by 200 µl of fresh/ice cold neutralization sol. (7.5 % HCL). The lysate was then transferred into 1.5 ml micro-centrifuge tubes and 1 ml of chloroform/methanol (1:2) was added/tube. The solution was vortexed for 15 seconds and the upper phase was applied to a Biorad AG1-X8 anion exchange resin (100-200 mesh). The resin was washed with water and 0.9 ml of the upper phase was loaded onto the column. The column was washed with 10 ml of 5 mM myo-inositol and 10 ml of 5 mM Na-borate/60mM Na-formate. The inositol trisphosphates were eluted into scintillation vials containing 10 ml of scintillation cocktail with 2 ml of 0.1 M formic acid/ 1 M ammonium formate. The columns were regenerated by washing with 10 ml of 0.1 M formic acid/3M ammonium formate and rinsed twice with ddH<sub>2</sub>O and stored at room temperature in water.

[0150] Following this round of assaying, candidate compounds having an IC<sub>50</sub> value of less than 10 µM were considered as potential leads for the development of pharmaceutical compositions.

-36-

## SCREENING CANDIDATE COMPOUNDS

[0151] Following the protocols set forth above, one compound, Compound 7 (Example 8, *supra*) evidenced the following results as shown in TABLE 4A:

TABLE 4A

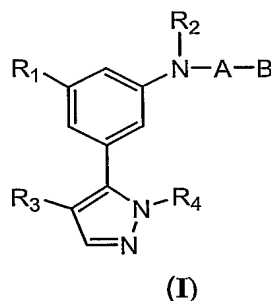
Compd No.	GTP $\gamma$ S AP-1 Percent Inhibition Relative To Positive Control (Primary)	GTP $\gamma$ S AP-1 Percent Inhibition Relative To Positive Control (Reconfirm)	Competitive Binding AP-1 (( $^3$ H)mesulergine)  IC <sub>50</sub> Value (nM)	Competitive Binding WT 5-HT <sub>2A</sub> (( $^3$ H)LSD)  IC <sub>50</sub> Value (nM)	Inositol Phosphate Accumulation AP-3  IC <sub>50</sub> Value (nM)
7	-1%	31%	2100 850	46	52 90

5

[0152] Based upon these results, structure activity analysis of the Compound 7 compound suggested that a series of derivatives of 3-(4-bromo-2-methylpyrazole-3-yl)phenylamine would exhibit similar 5-HT<sub>2A</sub> activity and selectivity. A series of derivatives of 3-(4-bromo-2-methylpyrazole-3-yl)phenylamine were synthesized. These "directed" library compounds (Tripos, Inc.) were then analyzed in accordance with the protocols of Examples 9c(1), 9c(2) and 9d.

10

[0153] This series of compounds exhibits highly selective 5-HT<sub>2A</sub> activity. Accordingly, in one aspect of the invention, a series of compounds possessing 5-HT<sub>2A</sub> receptor activity that are useful as inverse agonists at such receptors is designated by the general Formula (I):



15 wherein:

i) R<sub>1</sub> is H, halogens, NR<sub>5</sub>R<sub>6</sub>, OH or OR<sub>7</sub>, wherein

R<sub>5</sub> and R<sub>6</sub> are independently H, or C<sub>1-6</sub> alkyl, or C<sub>2-6</sub> alkenyl, or cycloalkyl, or aryl, or CH<sub>2</sub> aryl group and each said group may be optionally substituted by up to four substituents in any position independently selected from CF<sub>3</sub>, CCl<sub>3</sub>, Me, NO<sub>2</sub>,

-37-

OH, OMe, OEt, CONR<sub>8</sub>R<sub>9</sub>, NR<sub>8</sub>R<sub>9</sub>, NHCOCH<sub>3</sub>, OCF<sub>3</sub>, SMe, COOR<sub>10</sub>, SO<sub>3</sub>R<sub>8</sub>, SO<sub>2</sub>NR<sub>8</sub>R<sub>9</sub>, COMe, COEt, CO-lower alkyl, SCF<sub>3</sub>, CN, C<sub>2-6</sub> alkenyl, H, halogens, C<sub>1-4</sub> alkoxy, C<sub>3-6</sub> cycloalkyl, C<sub>1-6</sub> alkyl, and aryl wherein each of the C<sub>3-6</sub> cycloalkyl, C<sub>1-6</sub> alkyl, or aryl groups may be further optionally substituted by up to four substituents in any position independently selected from CF<sub>3</sub>, CCl<sub>3</sub>, Me, NO<sub>2</sub>, OH, OMe, OEt, CONR<sub>8</sub>R<sub>9</sub>, NR<sub>8</sub>R<sub>9</sub>, NHCOCH<sub>3</sub>, OCF<sub>3</sub>, SMe, COOR<sub>10</sub>, SO<sub>2</sub>NR<sub>8</sub>R<sub>9</sub>, SO<sub>3</sub>R<sub>10</sub>, COMe, COEt, CO-lower alkyl, SCF<sub>3</sub>, CN, C<sub>2-6</sub> alkenyl, H, halogens, C<sub>1-4</sub> alkoxy, C<sub>3-6</sub> cycloalkyl, C<sub>1-6</sub> alkyl, and aryl; or

R<sub>5</sub> and R<sub>6</sub> may form part of a 5, 6 or 7 membered cyclic structure which may be either saturated or unsaturated and that may contain up to four heteroatoms selected from O, N or S and said cyclic structure may be optionally substituted by up to four substituents in any position independently selected from CF<sub>3</sub>, CCl<sub>3</sub>, Me, NO<sub>2</sub>, OH, OMe, OEt, OCF<sub>3</sub>, SMe, COOR<sub>10</sub>, SO<sub>2</sub>NR<sub>8</sub>R<sub>9</sub>, SO<sub>3</sub>R<sub>10</sub>, NHCOCH<sub>3</sub>, COEt, COMe, or halogen;

R<sub>8</sub> and R<sub>9</sub> are independently a H, or C<sub>1-6</sub> alkyl, or C<sub>2-6</sub> alkenyl, or cycloalkyl, or aryl, or CH<sub>2</sub> aryl group and each said group may be optionally substituted by up to four substituents in any position independently selected from halogen, CF<sub>3</sub>, OCF<sub>3</sub>, OEt, CCl<sub>3</sub>, Me, NO<sub>2</sub>, OH, OMe, SMe, COMe, CN, COOR<sub>10</sub>, SO<sub>3</sub>R<sub>10</sub>, COEt, NHCOCH<sub>3</sub>, or aryl;

R<sub>10</sub> is H or C<sub>1-6</sub> alkyl;

R<sub>7</sub> is H or C<sub>1-6</sub> alkyl;

ii) R<sub>2</sub> is H, straight chain or branched C<sub>1-6</sub> alkyl, C<sub>2-6</sub> alkenyl, or cycloalkyl;

iii) R<sub>3</sub> is halogen, carboxy, CN, alkoxycarbonyl, straight chain or branched C<sub>1-6</sub> alkyl, C<sub>2-6</sub> alkenyl, C<sub>2-6</sub> alkynyl, cycloalkyl, aryl or heteroaryl, wherein each of said alkoxycarbonyl, straight chain or branched C<sub>1-6</sub> alkyl, C<sub>2-6</sub> alkenyl, C<sub>2-6</sub> alkynyl, cycloalkyl, aryl or heteroaryl groups can be optionally substituted with up to four substituents in any position selected from OH, OR<sub>10</sub>, NR<sub>8</sub>R<sub>9</sub>, halogen,

-C(p)<sub>3</sub>, or -O-C(p)<sub>3</sub> where p is halogen, and said cycloalkyl, aryl or heteroaryl groups can alternatively or additionally be optionally substituted with up to four alkyl substituents in any position;

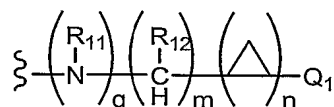
iv) R<sub>4</sub> is C<sub>1-6</sub> alkyl, C<sub>2-6</sub> alkenyl, or cycloalkyl;

v) A is C(=O), C(=S) or SO<sub>2</sub>;

vi) B is L<sub>1</sub> or L<sub>2</sub>;

L<sub>1</sub> is:

-38-



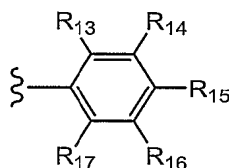
q is 0 or 1;

m is 0 or 1;

n is 0 or 1;

5

R<sub>11</sub> and R<sub>12</sub> are each independently H, straight chain or branched C<sub>1-6</sub> alkyl, C<sub>2-6</sub> alkenyl, or cycloalkyl;

Q<sub>1</sub> is:

wherein:

10

R<sub>13</sub>, R<sub>14</sub>, R<sub>15</sub>, R<sub>16</sub> and R<sub>17</sub> are each independently H, halogen, CN, NR<sub>8</sub>R<sub>9</sub>, COOR<sub>10</sub>, SR<sub>10</sub>, straight chain or branched C<sub>1-6</sub> alkyl, C<sub>2-6</sub> alkenyl, C<sub>2-6</sub> alkynyl, cycloalkyl, aryl, alkylaryl, arylalkyl or heteroaryl, wherein each of said alkoxy carbonyl, straight chain or branched C<sub>1-6</sub> alkyl, C<sub>2-6</sub> alkenyl, C<sub>2-6</sub> alkynyl, cycloalkyl, aryl, alkylaryl, arylalkyl or heteroaryl groups can be optionally substituted with up to four substituents in any position selected from NO<sub>2</sub>, OR<sub>10</sub>, NR<sub>8</sub>R<sub>9</sub>, halogen, -C(p)<sub>3</sub>, or -O-C(p)<sub>3</sub> where p is halogen, and said cycloalkyl, aryl, alkylaryl, arylalkyl or heteroaryl groups can alternatively or additionally be optionally substituted with up to four alkyl substituents in any position;

15

20

L<sub>2</sub> is -O-Q<sub>2</sub> wherein Q<sub>2</sub> is straight chain or branched C<sub>1-6</sub> alkyl,

C<sub>2-6</sub> alkenyl, C<sub>2-6</sub> alkynyl, cycloalkyl, aryl, alkylaryl, arylalkyl, wherein each of said cycloalkyl, aryl, alkylaryl, or arylalkyl groups can be optionally substituted with up to four substituents in any position selected from NO<sub>2</sub>, OR<sub>7</sub>, halogen, -C(p)<sub>3</sub>, or -O-C(p)<sub>3</sub> where p is halogen, or an aliphatic or aromatic heterocycle, and said cycloalkyl, aryl, alkylaryl, and arylalkyl groups can alternatively or additionally be optionally substituted with up to four alkyl substituents in any position; or a pharmaceutically acceptable salt.

25

30

**[0154]**

An aryl moiety can be a 5 or 6 membered aromatic heterocyclic ring (containing up to 4 hetero atoms independently selected from N, O, or S) or a 6 membered aromatic non-heterocyclic ring or a polycycle. C<sub>1-6</sub> alkyl moieties can be straight chain or branched; optionally substituted C<sub>1-6</sub>

alkyl moieties can be straight chain or branched; C<sub>2-6</sub> alkenyl moieties can be straight chain or branched; and optionally substituted C<sub>2-6</sub> alkenyl moieties can be straight chain or branched. Examples of suitable C<sub>1-6</sub> alkyl groups include but are not limited to methyl, ethyl, n-propyl, i-propyl, n-butyl, and t-butyl. Halogens are typically F, Cl, Br, and I. Examples of 5 or 6 membered ring moieties include, but are not restricted to, phenyl, furanyl, thienyl, imidazolyl, pyridyl, pyrrolyl, oxazolyl, isoxazolyl, triazolyl, pyrazolyl, tetrazolyl, thiazolyl and isothiazoyl. Examples of polycycle moieties include, but are not restricted to, naphthyl, benzothiazolyl, benzofuranyl, benzimidazolyl, quinolyl, isoquinolyl, indolyl, quinoxalyl, quinazolinyl and benzothienyl.

[0155] In some embodiments of the foregoing Formula (I), compounds of Example 13, Experiments 1-43, *infra*, and combinations or subcombinations thereof, are included.

[0156] In some embodiments of the foregoing Formula (I), compounds of Example 13, Experiments 1-43, *infra*, and combinations or subcombinations thereof, are not included.

[0157] In some embodiments of the compounds of Formula (I), B is L<sub>1</sub>, q is 1, m is 0, and n is 0. In further embodiments of the compounds of Formula (I), B is L<sub>1</sub>, q is 1, m is 1, and n is 0. In further embodiments of the compounds of Formula (I), B is L<sub>1</sub>, q is 1, m is 0, and n is 1. In further embodiments of the compounds of Formula (I), B is L<sub>1</sub>, q is 0, m is 0, and n is 0.

[0158] In some embodiments of the compounds of Formula (I), B is L<sub>2</sub>. In further embodiments of the compounds of Formula (I), A, is C(=O). In further embodiments of the compounds of Formula (I), A, is C(=S). In further embodiments of the compounds of Formula (I), A, is SO<sub>2</sub>.

[0159] In further embodiments of the compounds of Formula (I), R<sub>1</sub> is H, Cl, F, dimethylamino, pyrrolidin-1-yl, morpholin-1-yl, 4-methylpiperazin-1-yl, OH or OCH<sub>3</sub>.

[0160] In some embodiments of the compounds of Formula (I), R<sub>3</sub> is Cl, Br, I, -COOCH<sub>3</sub>, 2-hydroxyethyl, 2-(dimethylamino)ethyl, vinyl, ethyl, phenyl, 4-methoxyphenyl, 3-methoxyphenyl, 4-fluorophenyl, 4-trifluoromethoxyphenyl, thiophenyl, carboxy, cyclopropyl, -CCH, -CH=CH-CCH, or CN.

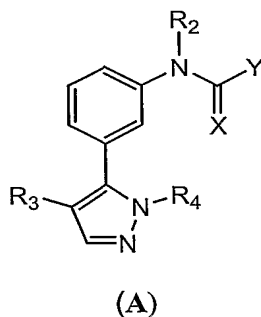
[0161] In some embodiments of the compounds of Formula (I), where B is L<sub>1</sub>, q is 1, m is 0, n is 0 and A is C(=O), R<sub>1</sub> is H, Cl, F, dimethylamino, pyrrolidin-1-yl, morpholin-1-yl, 4-methylpiperazin-1-yl, OH or OCH<sub>3</sub>.

- [0162] In some embodiments of the compounds of Formula (I), where B is L<sub>1</sub>, q is 1, m is 0, n is 0 and A is C(=O), R<sub>3</sub> is Cl, Br, I, -COOCH<sub>3</sub>, 2-hydroxyethyl, 2-(dimethylamino)ethyl, vinyl, ethyl, phenyl, 4-methoxyphenyl, 3-methoxyphenyl, 4-fluorophenyl, 4-trifluoromethoxyphenyl, thiophenyl, carboxy, cyclopropyl, -CCH, -CH=CH-CCH, or CN.
- 5 [0163] In some embodiments of the compounds of Formula (I), where B is L<sub>1</sub>, q is 1, m is 1, n is 0 and A is C(=O), R<sub>1</sub> is H, Cl, F, dimethylamino, pyrrolidin-1-yl, morpholin-1-yl, 4-methylpiperazin-1-yl, OH or OCH<sub>3</sub>.
- [0164] In some embodiments of the compounds of Formula (I), where B is L<sub>1</sub>, q is 1, m is 1, and n is 0, R<sub>3</sub> is Cl, Br, I, -COOCH<sub>3</sub>, 2-hydroxyethyl, 2-(dimethylamino)ethyl, vinyl, ethyl, phenyl, 4-methoxyphenyl, 3-methoxyphenyl, 4-fluorophenyl, 4-trifluoromethoxyphenyl, thiophenyl, carboxy, 10 cyclopropyl, -CCH, -CH=CH-CCH, or CN.
- [0165] In some embodiments of the compounds of Formula (I), where B is L<sub>1</sub>, q is 1, m is 0, n is 1 and A is C(=O), R<sub>1</sub> is H, Cl, F, dimethylamino, pyrrolidin-1-yl, morpholin-1-yl, 4-methylpiperazin-1-yl, OH or OCH<sub>3</sub>.
- 15 [0166] In some embodiments of the compounds of Formula (I), where B is L<sub>1</sub>, q is 1, m is 0, and n is 1, R<sub>3</sub> is Cl, Br, I, -COOCH<sub>3</sub>, 2-hydroxyethyl, 2-(dimethylamino)ethyl, vinyl, ethyl, phenyl, 4-methoxyphenyl, 3-methoxyphenyl, 4-fluorophenyl, 4-trifluoromethoxyphenyl, thiophenyl, carboxy, cyclopropyl, -CCH, -CH=CH-CCH, or CN.
- [0167] In some of each of the foregoing embodiments of the compounds of Formula (I), R<sub>2</sub> is H and R<sub>4</sub> is methyl of each of the foregoing embodiments of the compounds of Formula (I), R<sub>13</sub>, R<sub>14</sub>, 20 R<sub>15</sub>, R<sub>16</sub> and R<sub>17</sub> are each independently H, F, Cl, Br, CN, dimethylamino, ethoxycarbonyl, methylthio, methyl, ethyl, isopropyl, trifluoromethyl, trifluoromethoxy, methoxy, NH<sub>2</sub> or NO<sub>2</sub>.
- [0168] In some embodiments of the compounds of Formula (I), where B is L<sub>1</sub>, q is 0, m is 0, and n is 0, A is SO<sub>2</sub>. In some of such embodiments, R<sub>2</sub> is H and R<sub>4</sub> is methyl. In still further such 25 embodiments, R<sub>3</sub> is Cl, Br, I, -COOCH<sub>3</sub>, 2-hydroxyethyl, 2-(dimethylamino)ethyl, vinyl, ethyl, phenyl, 4-methoxyphenyl, 3-methoxyphenyl, 4-fluorophenyl, 4-trifluoromethoxyphenyl, thiophenyl, carboxy, cyclopropyl, -CCH, -CH=CH-CCH, or CN.
- [0169] In some embodiments of the compounds of Formula (I), B is L<sub>2</sub>. In some such 30 embodiments, A is (C=O). In further such embodiments, R<sub>4</sub> is methyl. In still further such embodiments, R<sub>2</sub> is H. In further such embodiments, Q<sub>1</sub> is ethyl, 4-nitrophenyl, allyl, 4-methylphenyl, isopropyl, butyl, 2-isopropyl-5-methylcyclohexyl, benzyl, 3-bromophenyl, 4-fluorophenyl, 2-

-41-

methoxyphenyl, 2-chlorophenyl,  $-C(CH_3)=CH$ , 1-(N-pyridyl)ethyl, or 9-fluorenylmethyl. In further such embodiments, R<sub>1</sub> is H, Cl, F, dimethylamino, pyrrolidin-1-yl, morpholin-1-yl, 4-methylpiperazin-1-yl, OH or OCH<sub>3</sub>; and R<sub>3</sub> is Cl, Br, I, -COOCH<sub>3</sub>, 2-hydroxyethyl, 2-(dimethylamino)ethyl, vinyl, ethyl, phenyl, 4-methoxyphenyl, 3-methoxyphenyl, 4-fluorophenyl, 4-trifluoromethoxyphenyl, thiophenyl, carboxy, cyclopropyl, -CCH, -CH=CH-CCH, or CN.

**[0170]** In another aspect of the invention, a series of compounds possessing 5-HT<sub>2A</sub> receptor activity that are useful as inverse agonists at such receptors is designated by Formula (A):



10 wherein:

R<sub>2</sub> is H or lower alkyl(C<sub>1-4</sub>);

R<sub>3</sub> is lower alkyl (C<sub>1-6</sub>), or halogen;

R<sub>4</sub> is lower alkyl (C<sub>1-6</sub>);

X is either Oxygen or Sulfur;

15 Y is NR<sub>15</sub>R<sub>16</sub>, or (CH<sub>2</sub>)<sub>m</sub>R<sub>17</sub>, or O(CH<sub>2</sub>)<sub>n</sub>R<sub>17</sub>;

m=0-4

n=0-4

R<sub>15</sub> is H or lower alkyl(C<sub>1-4</sub>);

20 R<sub>16</sub> and R<sub>17</sub> are independently C<sub>1-6</sub> alkyl, or C<sub>2-6</sub> alkenyl, or cycloalkyl, or aryl, or CH<sub>2</sub> aryl group and each said group may be optionally substituted by up to four substituents in any position independently selected from CF<sub>3</sub>, CCl<sub>3</sub>, Me, NO<sub>2</sub>, OH, OMe, OEt, CONR<sub>18</sub>R<sub>19</sub>, NR<sub>18</sub>R<sub>19</sub>, NHCOCH<sub>3</sub>, OCF<sub>3</sub>, SMe, COOR<sub>20</sub>, SO<sub>3</sub>R<sub>20</sub>, SO<sub>2</sub>NR<sub>18</sub>R<sub>19</sub>, COMe, COEt, CO-lower alkyl, SCF<sub>3</sub>, CN, C<sub>2-6</sub> alkenyl, H, halogens, C<sub>1-4</sub> alkoxy, C<sub>3-6</sub> cycloalkyl, C<sub>1-6</sub> alkyl, and aryl;

25 R<sub>18</sub> and R<sub>19</sub> are independently a H or C<sub>1-6</sub> alkyl, or C<sub>2-6</sub> alkenyl, or cycloalkyl, or aryl, or CH<sub>2</sub> aryl group and each said group may be optionally substituted by up to four substituents in any position independently selected from CF<sub>3</sub>, CCl<sub>3</sub>, Me, NO<sub>2</sub>, OH, OMe, OEt, CONR<sub>21</sub>R<sub>22</sub>, NR<sub>21</sub>R<sub>22</sub>, NHCOCH<sub>3</sub>, OCF<sub>3</sub>, SMe, COOR<sub>23</sub>, SO<sub>3</sub>R<sub>23</sub>,

-42-

SO<sub>2</sub>NR<sub>21</sub>R<sub>22</sub>, COMe, COEt, CO-lower alkyl, SCF<sub>3</sub>, CN, C<sub>2-6</sub> alkenyl, H, halogens, C<sub>1-4</sub> alkoxy, C<sub>3-6</sub> cycloalkyl, C<sub>1-6</sub> alkyl, and aryl;

or R<sub>18</sub> and R<sub>19</sub> may form part of a 5, 6 or 7 membered cyclic structure which may be either saturated or unsaturated and that may contain up to four heteroatoms selected from O, N or S and said cyclic structure may be optionally substituted by up to four substituents in any position independently selected from CF<sub>3</sub>, CCl<sub>3</sub>, Me, NO<sub>2</sub>, OH, OMe, OEt, OCF<sub>3</sub>, SMe, COOR<sub>23</sub>, SO<sub>2</sub>NR<sub>21</sub>R<sub>22</sub>, SO<sub>3</sub>R<sub>23</sub>, NHCOCH<sub>3</sub>, COEt, COMe, or halogen;

R<sub>20</sub> and R<sub>23</sub> are each independently selected from H or C<sub>1-6</sub> alkyl;

R<sub>21</sub> and R<sub>22</sub> are each independently are independently a H, or C<sub>1-6</sub> alkyl, or C<sub>2-6</sub> alkenyl, or cycloalkyl, or aryl, or CH<sub>2</sub> aryl group and each said group may be optionally substituted by up to four substituents in any position independently selected from halogen, CF<sub>3</sub>, OCF<sub>3</sub>, OEt, CCl<sub>3</sub>, Me, NO<sub>2</sub>, OH, OMe, SMe, COMe, CN, COOR<sub>20</sub>, SO<sub>3</sub>R<sub>20</sub>, COEt, NHCOCH<sub>3</sub>, or aryl;

an aryl moiety can be a 5 or 6 membered aromatic heterocyclic ring (containing up to 4 heteroatoms independently selected from N, O, or S) or a 6 membered aromatic non-heterocyclic ring or a polycycle;

C<sub>1-6</sub> alkyl moieties can be straight chain or branched;

optionally substituted C<sub>1-6</sub> alkyl moieties can be straight chain or branched;

C<sub>2-6</sub> alkenyl moieties can be straight chain or branched; and

optionally substituted C<sub>2-6</sub> alkenyl moieties can be straight chain or branched.

**[0171]** Examples of suitable C<sub>1-6</sub> alkyl groups include but are not limited to methyl, ethyl, n-propyl, i-propyl, n-butyl, and t-butyl.

**[0172]** Halogens are typically F, Cl, Br, and I.

**[0173]** Examples of 5 or 6 membered ring moieties include, but are not restricted to, phenyl, furanyl, thienyl, imidazolyl, pyridyl, pyrrolyl, oxazolyl, isoxazolyl, triazolyl, pyrazolyl, tetrazolyl, thiazolyl and isothiazoyl. Examples of polycycle moieties include, but are not restricted to, naphthyl, benzothiazolyl, benzofuranyl, benzimidazolyl, quinolyl, isoquinolyl, indolyl, quinoxaliny, quinazolinyl and benzothienyl.

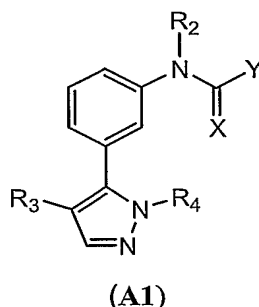
**[0174]** In some embodiments of the foregoing genus (A), compounds of Example 13, Experiments 1-43, *infra*, and combinations or subcombinations thereof, are included.

**[0175]** In some embodiments of the foregoing genus (A), compounds of Example 13, Experiments 1-43, *infra*, and combinations or subcombinations thereof, are not included.



-43-

[0176] In some preferred embodiments, compounds possessing 5-HT<sub>2A</sub> receptor activity that are useful as inverse agonists at such receptors are designated by the general Formula A1:



5 wherein:

R<sub>3</sub> is F, Cl, Br, I, C<sub>1-6</sub> straight chain or branched alkyl, C<sub>3-8</sub> cycloalkyl, C<sub>4-9</sub> alkylcycloalkyl, or C<sub>2-6</sub> alkenyl;

X is O or S;

Y is NR<sub>15</sub>R<sub>16</sub>, or (CH<sub>2</sub>)<sub>m</sub>R<sub>17</sub>, or O(CH<sub>2</sub>)<sub>n</sub>R<sub>17</sub>;

10 m is an integer between 0 and 4, inclusive;

n is an integer between 0 and 4, inclusive;

R<sub>4</sub> is H, C<sub>1-8</sub> straight chain or branched alkyl, C<sub>3-8</sub> cycloalkyl, C<sub>4-9</sub> alkylcycloalkyl, or C<sub>2-8</sub> alkenyl;

15 R<sub>2</sub> and R<sub>15</sub> are each independently selected from H, C<sub>1-8</sub> straight chain or branched alkyl, C<sub>3-8</sub> cycloalkyl, C<sub>4-9</sub> alkylcycloalkyl, or C<sub>2-8</sub> alkenyl;

20 R<sub>16</sub> and R<sub>17</sub> are each independently selected from: C<sub>1-8</sub> straight chain or branched alkyl, C<sub>2-8</sub> alkenyl or cycloalkyl, or alkylcycloalkyl, or aryl, or CH<sub>2</sub>aryl, wherein each moiety within said C<sub>1-8</sub> straight chain or branched alkyl, C<sub>2-8</sub> alkenyl or cycloalkyl, or alkylcycloalkyl, or aryl or CH<sub>2</sub>aryl may be optionally substituted by up to four substituents in any position, whereby each substituent is independently selected from: H, F, Cl, Br, I, R<sub>20</sub>, CF<sub>3</sub>, CF<sub>2</sub>R<sub>7</sub>, CF<sub>2</sub>CF<sub>2</sub>, CCl<sub>3</sub>, CCl<sub>2</sub>R<sub>7</sub>, CCl<sub>2</sub>CCl<sub>2</sub>R<sub>7</sub>, NR<sub>18</sub>R<sub>19</sub>, NR<sub>18</sub>COR<sub>20</sub>, NR<sub>18</sub>SO<sub>2</sub>R<sub>20</sub>, OR<sub>20</sub>, OCF<sub>3</sub>, OCF<sub>2</sub>R<sub>20</sub>, OCF<sub>2</sub>CF<sub>2</sub>R<sub>20</sub>, OCOR<sub>20</sub>, OSO<sub>2</sub>R<sub>20</sub>, OPO(OR<sub>20</sub>)<sub>2</sub>, SR<sub>20</sub>, SCF<sub>3</sub>, SCF<sub>2</sub>R<sub>20</sub>, SCF<sub>2</sub>CF<sub>2</sub>R<sub>20</sub>, SCOR<sub>20</sub>, SO<sub>3</sub>R<sub>20</sub>, SO<sub>2</sub>NR<sub>18</sub>R<sub>19</sub>, PO(OR<sub>20</sub>)<sub>3</sub>, PO(OR<sub>20</sub>)<sub>2</sub>R<sub>20</sub>, NO<sub>2</sub>, CN, CNR<sub>20</sub>(NR<sub>18</sub>R<sub>19</sub>), CNR<sub>18</sub>(SR<sub>20</sub>), COOR<sub>20</sub>, COSR<sub>20</sub>, CONR<sub>18</sub>R<sub>19</sub>,

25 with the proviso that when R<sub>16</sub> or R<sub>17</sub> contains an aryl ring substituted at at least two adjacent positions on said aryl ring, then said two adjacent positions can together be selected from SCH<sub>2</sub>S, SCH<sub>2</sub>CH<sub>2</sub>S, OCH<sub>2</sub>O, or OCH<sub>2</sub>CH<sub>2</sub>O to form a bi-cyclic structure;

R<sub>20</sub> is H, C<sub>1-8</sub> straight chain or branched alkyl, C<sub>3-8</sub> cycloalkyl, C<sub>4-9</sub> alkylcycloalkyl, C<sub>2-8</sub> alkenyl, aryl or alkylaryl;

R<sub>18</sub> and R<sub>19</sub> are each independently selected from H, C<sub>1-8</sub> straight chain or branched alkyl, C<sub>2-8</sub> alkenyl or cycloalkyl, or alkylcycloalkyl, or aryl, or CH<sub>2</sub>aryl, wherein each moiety within said C<sub>1-8</sub> straight chain or branched alkyl, C<sub>2-8</sub> alkenyl or cycloalkyl, or alkylcycloalkyl, or aryl or CH<sub>2</sub>aryl may be optionally substituted by up to four substituents in any position, whereby each substituent is

5 independently selected from: F, Cl, Br, I, CF<sub>3</sub>, CCl<sub>3</sub>, CH<sub>3</sub>, C<sub>2</sub>H<sub>5</sub>, C<sub>3</sub>H<sub>7</sub>, C<sub>4</sub>H<sub>9</sub>, NH<sub>2</sub>, NHCH<sub>3</sub>, N(CH<sub>3</sub>)<sub>2</sub>, NHC<sub>2</sub>H<sub>5</sub>, N(C<sub>2</sub>H<sub>5</sub>)<sub>2</sub>, NHC<sub>3</sub>H<sub>7</sub>, N(C<sub>3</sub>H<sub>7</sub>)<sub>2</sub>, NHC<sub>4</sub>H<sub>9</sub>, N(C<sub>4</sub>H<sub>9</sub>)<sub>2</sub>, NHCOH, NHCOCH<sub>3</sub>, NHCOC<sub>2</sub>H<sub>5</sub>, NHCOC<sub>3</sub>H<sub>7</sub>, NHCOC<sub>4</sub>H<sub>9</sub>, NHSO<sub>2</sub>CH<sub>3</sub>, NHSO<sub>2</sub>C<sub>2</sub>H<sub>5</sub>, NHSO<sub>2</sub>C<sub>3</sub>H<sub>7</sub>, NHSO<sub>2</sub>C<sub>4</sub>H<sub>9</sub>, OH, OCH<sub>3</sub>, OC<sub>2</sub>H<sub>5</sub>, OC<sub>3</sub>H<sub>7</sub>, OC<sub>4</sub>H<sub>9</sub>, OC<sub>5</sub>H<sub>11</sub>, OC<sub>6</sub>H<sub>13</sub>, OCF<sub>3</sub>, OCOCH<sub>3</sub>, OCOC<sub>2</sub>H<sub>5</sub>, OCOC<sub>3</sub>H<sub>7</sub>, OCOC<sub>4</sub>H<sub>9</sub>, OSO<sub>2</sub>CH<sub>3</sub>, OSO<sub>2</sub>C<sub>2</sub>H<sub>5</sub>, OSO<sub>2</sub>C<sub>3</sub>H<sub>7</sub>, OSO<sub>2</sub>C<sub>4</sub>H<sub>9</sub>, SH, SCH<sub>3</sub>, SC<sub>2</sub>H<sub>5</sub>, SC<sub>3</sub>H<sub>7</sub>, SC<sub>4</sub>H<sub>9</sub>, SC<sub>5</sub>H<sub>11</sub>, SC<sub>6</sub>H<sub>13</sub>, SCF<sub>3</sub>, SCOCH<sub>3</sub>, SCOC<sub>2</sub>H<sub>5</sub>, SCOC<sub>3</sub>H<sub>7</sub>, SCOC<sub>4</sub>H<sub>9</sub>, SO<sub>3</sub>CH<sub>3</sub>, SO<sub>3</sub>C<sub>2</sub>H<sub>5</sub>, SO<sub>3</sub>C<sub>3</sub>H<sub>7</sub>, SO<sub>3</sub>C<sub>4</sub>H<sub>9</sub>, SO<sub>2</sub>NH, SO<sub>2</sub>NH<sub>2</sub>, SO<sub>2</sub>NHCH<sub>3</sub>, SO<sub>2</sub>N(CH<sub>3</sub>)<sub>2</sub>, SO<sub>2</sub>NHC<sub>2</sub>H<sub>5</sub>, SO<sub>2</sub>N(C<sub>2</sub>H<sub>5</sub>)<sub>2</sub>, SO<sub>2</sub>NHC<sub>3</sub>H<sub>7</sub>, SO<sub>2</sub>N(C<sub>3</sub>H<sub>7</sub>)<sub>2</sub>, SO<sub>2</sub>NHC<sub>4</sub>H<sub>9</sub>, SO<sub>2</sub>N(C<sub>4</sub>H<sub>9</sub>)<sub>2</sub>, NO<sub>2</sub>, CN, COOCH<sub>3</sub>, COOC<sub>2</sub>H<sub>5</sub>, COOC<sub>3</sub>H<sub>7</sub>, COOC<sub>4</sub>H<sub>9</sub>, COSCH<sub>3</sub>, COSC<sub>2</sub>H<sub>5</sub>, COSC<sub>3</sub>H<sub>7</sub>, COSC<sub>4</sub>H<sub>9</sub>, CONH<sub>2</sub>, CONHCH<sub>3</sub>, CON(CH<sub>3</sub>)<sub>2</sub>, CONHC<sub>2</sub>H<sub>5</sub>, CON(C<sub>2</sub>H<sub>5</sub>)<sub>2</sub>, CONHC<sub>3</sub>H<sub>7</sub>, CON(C<sub>3</sub>H<sub>7</sub>)<sub>2</sub>, CONHC<sub>4</sub>H<sub>9</sub>, CON(C<sub>4</sub>H<sub>9</sub>)<sub>2</sub>, and

10 with the proviso that when either or both of R<sub>18</sub> or R<sub>19</sub> contain an aryl ring substituted at at least two adjacent positions on said aryl ring, then said two adjacent positions can together be selected from SCH<sub>2</sub>S, SCH<sub>2</sub>CH<sub>2</sub>S, OCH<sub>2</sub>O, or OCH<sub>2</sub>CH<sub>2</sub>O to form a bi-cyclic structure;

or

20 R<sub>18</sub> or R<sub>19</sub> may together form part of a 5, 6 or 7 membered cyclic structure, with said structure being saturated or unsaturated, and further with said structure containing up to four heteroatoms selected from O, N or S, and further wherein each moiety within said cyclic structure being optionally substituted by up to four substituents in any position independently selected from: F, Cl, Br, I, CF<sub>3</sub>, CCl<sub>3</sub>, CH<sub>3</sub>, C<sub>2</sub>H<sub>5</sub>, C<sub>3</sub>H<sub>7</sub>, C<sub>4</sub>H<sub>9</sub>, NH<sub>2</sub>, NHCH<sub>3</sub>, N(CH<sub>3</sub>)<sub>2</sub>, NHC<sub>2</sub>H<sub>5</sub>, N(C<sub>2</sub>H<sub>5</sub>)<sub>2</sub>, NHC<sub>3</sub>H<sub>7</sub>, N(C<sub>3</sub>H<sub>7</sub>)<sub>2</sub>, NHC<sub>4</sub>H<sub>9</sub>, N(C<sub>4</sub>H<sub>9</sub>)<sub>2</sub>, NHCOH, NHCOCH<sub>3</sub>, NHCOC<sub>2</sub>H<sub>5</sub>, NHCOC<sub>3</sub>H<sub>7</sub>, NHCOC<sub>4</sub>H<sub>9</sub>, NHSO<sub>2</sub>CH<sub>3</sub>, NHSO<sub>2</sub>C<sub>2</sub>H<sub>5</sub>, NHSO<sub>2</sub>C<sub>3</sub>H<sub>7</sub>, NHSO<sub>2</sub>C<sub>4</sub>H<sub>9</sub>, OH, OCH<sub>3</sub>, OC<sub>2</sub>H<sub>5</sub>, OC<sub>3</sub>H<sub>7</sub>, OC<sub>4</sub>H<sub>9</sub>, OC<sub>5</sub>H<sub>11</sub>, OC<sub>6</sub>H<sub>13</sub>, OCF<sub>3</sub>, OCOCH<sub>3</sub>, OCOC<sub>2</sub>H<sub>5</sub>, OCOC<sub>3</sub>H<sub>7</sub>, OCOC<sub>4</sub>H<sub>9</sub>, OSO<sub>2</sub>CH<sub>3</sub>, OSO<sub>2</sub>C<sub>2</sub>H<sub>5</sub>, OSO<sub>2</sub>C<sub>3</sub>H<sub>7</sub>, OSO<sub>2</sub>C<sub>4</sub>H<sub>9</sub>, SH, SCH<sub>3</sub>, SC<sub>2</sub>H<sub>5</sub>, SC<sub>3</sub>H<sub>7</sub>, SC<sub>4</sub>H<sub>9</sub>, SC<sub>5</sub>H<sub>11</sub>, SC<sub>6</sub>H<sub>13</sub>, SCF<sub>3</sub>, SCOCH<sub>3</sub>, SCOC<sub>2</sub>H<sub>5</sub>, SCOC<sub>3</sub>H<sub>7</sub>, SCOC<sub>4</sub>H<sub>9</sub>, SO<sub>3</sub>CH<sub>3</sub>, SO<sub>3</sub>C<sub>2</sub>H<sub>5</sub>, SO<sub>3</sub>C<sub>3</sub>H<sub>7</sub>, SO<sub>3</sub>C<sub>4</sub>H<sub>9</sub>, SO<sub>2</sub>NH, SO<sub>2</sub>NH<sub>2</sub>, SO<sub>2</sub>NHCH<sub>3</sub>, SO<sub>2</sub>N(CH<sub>3</sub>)<sub>2</sub>, SO<sub>2</sub>NHC<sub>2</sub>H<sub>5</sub>, SO<sub>2</sub>N(C<sub>2</sub>H<sub>5</sub>)<sub>2</sub>, SO<sub>2</sub>NHC<sub>3</sub>H<sub>7</sub>, SO<sub>2</sub>N(C<sub>3</sub>H<sub>7</sub>)<sub>2</sub>, SO<sub>2</sub>NHC<sub>4</sub>H<sub>9</sub>, SO<sub>2</sub>N(C<sub>4</sub>H<sub>9</sub>)<sub>2</sub>, NO<sub>2</sub>, CN, COOCH<sub>3</sub>, COOC<sub>2</sub>H<sub>5</sub>, COOC<sub>3</sub>H<sub>7</sub>, COOC<sub>4</sub>H<sub>9</sub>, COSCH<sub>3</sub>, COSC<sub>2</sub>H<sub>5</sub>, COSC<sub>3</sub>H<sub>7</sub>, COSC<sub>4</sub>H<sub>9</sub>, CONH<sub>2</sub>, CONHCH<sub>3</sub>, CON(CH<sub>3</sub>)<sub>2</sub>, CONHC<sub>2</sub>H<sub>5</sub>, CON(C<sub>2</sub>H<sub>5</sub>)<sub>2</sub>, CONHC<sub>3</sub>H<sub>7</sub>, CON(C<sub>3</sub>H<sub>7</sub>)<sub>2</sub>, CONHC<sub>4</sub>H<sub>9</sub>, CON(C<sub>4</sub>H<sub>9</sub>)<sub>2</sub>, and

25 with the proviso that wherein when R<sub>18</sub> or R<sub>19</sub> form an aryl ring substituted at at least two adjacent positions on said aryl ring, then said two adjacent positions can together

30

35

-45-

be selected from SCH<sub>2</sub>S, SCH<sub>2</sub>CH<sub>2</sub>S, OCH<sub>2</sub>O, or OCH<sub>2</sub>CH<sub>2</sub>O to form a bi-cyclic structure.

[0177] An aryl moiety can be a 5 or 6 membered aromatic heterocyclic ring (containing up to 4 hetero atoms independently selected from N, O, or S) or a 6 membered aromatic non-heterocyclic ring or a polycycle;

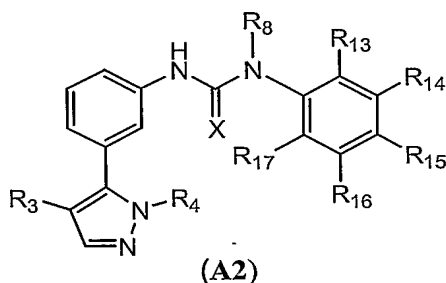
Examples of suitable C<sub>1-8</sub> alkyl groups include but are not limited to methyl, ethyl, n-propyl, i-propyl, n-butyl, and t-butyl.

[0178] Examples of 5 or 6 membered ring moieties include, but are not restricted to, phenyl, furanyl, thienyl, imidazolyl, pyridyl, pyrrolyl, oxazolyl, isoxazolyl, triazolyl, pyrazolyl, tetrazolyl, thiazolyl, and isothiazolyl. Examples of polycycle moieties include, but are not restricted to, naphthyl, benzothiazolyl, benzofuranyl, benzimidazolyl, quinolyl, isoquinolyl, indolyl, quinoxalyl, quinazolinyl, and benzothienyl.

[0179] In some embodiments of the foregoing genus (A), compounds of Experiments 1-43, *infra*, and combinations or subcombinations thereof, are included.

[0180] In some embodiments of the foregoing genus (A), compounds of Experiments 1-43, *infra*, and combinations or subcombinations thereof, are not included.

[0181] Preferred compounds falling within the scope of general Formula (A) as Class (1) compounds where Y = N<sub>15</sub>R<sub>16</sub> and has the Formula (A2):



wherein:

X is O or S;

R<sub>4</sub> is H or CH<sub>3</sub>;

R<sub>8</sub> and R<sub>20</sub> are each independently selected from H, C<sub>1-8</sub> straight chain or branched alkyl, C<sub>3-8</sub> cycloalkyl, C<sub>4-9</sub> alkylcycloalkyl, or C<sub>2-8</sub> alkenyl;

R<sub>15</sub> is H, F, Cl, Br, I, R<sub>20</sub>, CF<sub>3</sub>, CF<sub>2</sub>R<sub>20</sub>, CF<sub>2</sub>CF<sub>2</sub>, CCl<sub>3</sub>, CCl<sub>2</sub>R<sub>20</sub>, CCl<sub>2</sub>CCl<sub>2</sub>R<sub>20</sub>, NR<sub>18</sub>R<sub>19</sub>, NR<sub>19</sub>COR<sub>20</sub>, NR<sub>19</sub>SO<sub>2</sub>R<sub>20</sub>, OR<sub>20</sub>, OCF<sub>3</sub>, OCF<sub>2</sub>R<sub>20</sub>, OCF<sub>2</sub>CF<sub>2</sub>R<sub>20</sub>, OCOR<sub>20</sub>, OSO<sub>2</sub>R<sub>20</sub>, OPO(OR<sub>20</sub>)<sub>2</sub>,

-46-

SR<sub>20</sub>, SCF<sub>3</sub>, SCF<sub>2</sub>R<sub>20</sub>, SCF<sub>2</sub>CF<sub>2</sub>R<sub>20</sub>, SCOR<sub>20</sub>, SO<sub>3</sub>R<sub>20</sub>, SO<sub>2</sub>NR<sub>18</sub>R<sub>19</sub>, PO(OR<sub>20</sub>)<sub>3</sub>, PO(OR<sub>20</sub>)<sub>2</sub>R<sub>20</sub>, NO<sub>2</sub>, CN, CNR<sub>20</sub>(NR<sub>18</sub>R<sub>19</sub>), CNR<sub>19</sub>(SR<sub>20</sub>), COOR<sub>20</sub>, COSR<sub>20</sub>, CONR<sub>18</sub>R<sub>19</sub>,

with the proviso that when a position adjacent to R<sub>15</sub> is substituted, then R<sub>15</sub> and said adjacent position can together be selected from SCH<sub>2</sub>S, SCH<sub>2</sub>CH<sub>2</sub>S, OCH<sub>2</sub>O, or OCH<sub>2</sub>CH<sub>2</sub>O to form a bi-cyclic structure;

R<sub>18</sub> and R<sub>19</sub> are each independently selected from H, C<sub>1-8</sub> straight chain or branched alkyl, C<sub>2-8</sub> alkenyl or cycloalkyl, or alkylcycloalkyl, or aryl, or CH<sub>2</sub>aryl, wherein each moiety within said C<sub>1-8</sub> straight chain or branched alkyl, C<sub>2-8</sub> alkenyl or cycloalkyl, or alkylcycloalkyl, or aryl or CH<sub>2</sub>aryl may be optionally substituted by up to four substituents in any position, whereby each substituent is independently selected from: F, Cl, Br, I, CF<sub>3</sub>, CCl<sub>3</sub>, CH<sub>3</sub>, C<sub>2</sub>H<sub>5</sub>, C<sub>3</sub>H<sub>7</sub>, C<sub>4</sub>H<sub>9</sub>, NH<sub>2</sub>, NHCH<sub>3</sub>, N(CH<sub>3</sub>)<sub>2</sub>, NHC<sub>2</sub>H<sub>5</sub>, N(C<sub>2</sub>H<sub>5</sub>)<sub>2</sub>, NHC<sub>3</sub>H<sub>7</sub>, N(C<sub>3</sub>H<sub>7</sub>)<sub>2</sub>, NHC<sub>4</sub>H<sub>9</sub>, N(C<sub>4</sub>H<sub>9</sub>)<sub>2</sub>, NHCOH, NHCOCH<sub>3</sub>, NHCOC<sub>2</sub>H<sub>5</sub>, NHCOC<sub>3</sub>H<sub>7</sub>, NHCOC<sub>4</sub>H<sub>9</sub>, NHSO<sub>2</sub>CH<sub>3</sub>, NHSO<sub>2</sub>C<sub>2</sub>H<sub>5</sub>, NHSO<sub>2</sub>C<sub>3</sub>H<sub>7</sub>, NHSO<sub>2</sub>C<sub>4</sub>H<sub>9</sub>, OH, OCH<sub>3</sub>, OC<sub>2</sub>H<sub>5</sub>, OC<sub>3</sub>H<sub>7</sub>, OC<sub>4</sub>H<sub>9</sub>, OC<sub>5</sub>H<sub>11</sub>, OC<sub>6</sub>H<sub>13</sub>, OCF<sub>3</sub>, OCOCH<sub>3</sub>, OCOC<sub>2</sub>H<sub>5</sub>, OCOC<sub>3</sub>H<sub>7</sub>, OCOC<sub>4</sub>H<sub>9</sub>, OSO<sub>2</sub>CH<sub>3</sub>, OSO<sub>2</sub>C<sub>2</sub>H<sub>5</sub>, OSO<sub>2</sub>C<sub>3</sub>H<sub>7</sub>, OSO<sub>2</sub>C<sub>4</sub>H<sub>9</sub>, SH, SCH<sub>3</sub>, SC<sub>2</sub>H<sub>5</sub>, SC<sub>3</sub>H<sub>7</sub>, SC<sub>4</sub>H<sub>9</sub>, SC<sub>5</sub>H<sub>11</sub>, SC<sub>6</sub>H<sub>13</sub>, SCF<sub>3</sub>, SCOCH<sub>3</sub>, SCOC<sub>2</sub>H<sub>5</sub>, SCOC<sub>3</sub>H<sub>7</sub>, SCOC<sub>4</sub>H<sub>9</sub>, SO<sub>3</sub>CH<sub>3</sub>, SO<sub>3</sub>C<sub>2</sub>H<sub>5</sub>, SO<sub>3</sub>C<sub>3</sub>H<sub>7</sub>, SO<sub>3</sub>C<sub>4</sub>H<sub>9</sub>, SO<sub>2</sub>NH, SO<sub>2</sub>NH<sub>2</sub>, SO<sub>2</sub>NHCH<sub>3</sub>, SO<sub>2</sub>N(CH<sub>3</sub>)<sub>2</sub>, SO<sub>2</sub>NHC<sub>2</sub>H<sub>5</sub>, SO<sub>2</sub>N(C<sub>2</sub>H<sub>5</sub>)<sub>2</sub>, SO<sub>2</sub>NHC<sub>3</sub>H<sub>7</sub>, SO<sub>2</sub>N(C<sub>3</sub>H<sub>7</sub>)<sub>2</sub>, SO<sub>2</sub>NHC<sub>4</sub>H<sub>9</sub>, SO<sub>2</sub>N(C<sub>4</sub>H<sub>9</sub>)<sub>2</sub>, NO<sub>2</sub>, CN, COOCH<sub>3</sub>, COOC<sub>2</sub>H<sub>5</sub>, COOC<sub>3</sub>H<sub>7</sub>, COOC<sub>4</sub>H<sub>9</sub>, COSCH<sub>3</sub>, COSC<sub>2</sub>H<sub>5</sub>, COSC<sub>3</sub>H<sub>7</sub>, COSC<sub>4</sub>H<sub>9</sub>, CONH<sub>2</sub>, CONHCH<sub>3</sub>, CON(CH<sub>3</sub>)<sub>2</sub>, CONHC<sub>2</sub>H<sub>5</sub>, CON(C<sub>2</sub>H<sub>5</sub>)<sub>2</sub>, CONHC<sub>3</sub>H<sub>7</sub>, CON(C<sub>3</sub>H<sub>7</sub>)<sub>2</sub>, CONHC<sub>4</sub>H<sub>9</sub>, CON(C<sub>4</sub>H<sub>9</sub>)<sub>2</sub>, and

with the proviso that when either or both of R<sub>18</sub> or R<sub>19</sub> contain an aryl ring substituted at at least two adjacent positions on said aryl ring, then said two adjacent positions can together be selected from SCH<sub>2</sub>S, SCH<sub>2</sub>CH<sub>2</sub>S, OCH<sub>2</sub>O, or OCH<sub>2</sub>CH<sub>2</sub>O to form a bi-cyclic structure;

R<sub>13</sub>, R<sub>14</sub>, R<sub>15</sub>, R<sub>16</sub> and R<sub>17</sub> each independently selected from the following: F, Cl, Br, I, CF<sub>3</sub>, CCl<sub>3</sub>, CH<sub>3</sub>, C<sub>2</sub>H<sub>5</sub>, C<sub>3</sub>H<sub>7</sub>, C<sub>4</sub>H<sub>9</sub>, NH<sub>2</sub>, NHCH<sub>3</sub>, N(CH<sub>3</sub>)<sub>2</sub>, NHC<sub>2</sub>H<sub>5</sub>, N(C<sub>2</sub>H<sub>5</sub>)<sub>2</sub>, NHC<sub>3</sub>H<sub>7</sub>, N(C<sub>3</sub>H<sub>7</sub>)<sub>2</sub>, NHC<sub>4</sub>H<sub>9</sub>, N(C<sub>4</sub>H<sub>9</sub>)<sub>2</sub>, NHCOH, NHCOCH<sub>3</sub>, NHCOC<sub>2</sub>H<sub>5</sub>, NHCOC<sub>3</sub>H<sub>7</sub>, NHCOC<sub>4</sub>H<sub>9</sub>, NHSO<sub>2</sub>CH<sub>3</sub>, NHSO<sub>2</sub>C<sub>2</sub>H<sub>5</sub>, NHSO<sub>2</sub>C<sub>3</sub>H<sub>7</sub>, NHSO<sub>2</sub>C<sub>4</sub>H<sub>9</sub>, OH, OCH<sub>3</sub>, OC<sub>2</sub>H<sub>5</sub>, OC<sub>3</sub>H<sub>7</sub>, OC<sub>4</sub>H<sub>9</sub>, OC<sub>5</sub>H<sub>11</sub>, OC<sub>6</sub>H<sub>13</sub>, OCF<sub>3</sub>, OCOCH<sub>3</sub>, OCOC<sub>2</sub>H<sub>5</sub>, OCOC<sub>3</sub>H<sub>7</sub>, OCOC<sub>4</sub>H<sub>9</sub>, OSO<sub>2</sub>CH<sub>3</sub>, OSO<sub>2</sub>C<sub>2</sub>H<sub>5</sub>, OSO<sub>2</sub>C<sub>3</sub>H<sub>7</sub>, OSO<sub>2</sub>C<sub>4</sub>H<sub>9</sub>, SH, SCH<sub>3</sub>, SC<sub>2</sub>H<sub>5</sub>, SC<sub>3</sub>H<sub>7</sub>, SC<sub>4</sub>H<sub>9</sub>, SC<sub>5</sub>H<sub>11</sub>, SC<sub>6</sub>H<sub>13</sub>, SCF<sub>3</sub>, SCOCH<sub>3</sub>, SCOC<sub>2</sub>H<sub>5</sub>, SCOC<sub>3</sub>H<sub>7</sub>, SCOC<sub>4</sub>H<sub>9</sub>, SO<sub>3</sub>CH<sub>3</sub>, SO<sub>3</sub>C<sub>2</sub>H<sub>5</sub>, SO<sub>3</sub>C<sub>3</sub>H<sub>7</sub>, SO<sub>3</sub>C<sub>4</sub>H<sub>9</sub>, SO<sub>2</sub>NH, SO<sub>2</sub>NH<sub>2</sub>, SO<sub>2</sub>NHCH<sub>3</sub>, SO<sub>2</sub>N(CH<sub>3</sub>)<sub>2</sub>, SO<sub>2</sub>NHC<sub>2</sub>H<sub>5</sub>, SO<sub>2</sub>N(C<sub>2</sub>H<sub>5</sub>)<sub>2</sub>, SO<sub>2</sub>NHC<sub>3</sub>H<sub>7</sub>, SO<sub>2</sub>N(C<sub>3</sub>H<sub>7</sub>)<sub>2</sub>, SO<sub>2</sub>NHC<sub>4</sub>H<sub>9</sub>, SO<sub>2</sub>N(C<sub>4</sub>H<sub>9</sub>)<sub>2</sub>, NO<sub>2</sub>, CN, COOCH<sub>3</sub>, COOC<sub>2</sub>H<sub>5</sub>, COOC<sub>3</sub>H<sub>7</sub>, COOC<sub>4</sub>H<sub>9</sub>, COSCH<sub>3</sub>, COSC<sub>2</sub>H<sub>5</sub>, COSC<sub>3</sub>H<sub>7</sub>, COSC<sub>4</sub>H<sub>9</sub>, CONH<sub>2</sub>, CONHCH<sub>3</sub>, CON(CH<sub>3</sub>)<sub>2</sub>, CONHC<sub>2</sub>H<sub>5</sub>, CON(C<sub>2</sub>H<sub>5</sub>)<sub>2</sub>, CONHC<sub>3</sub>H<sub>7</sub>, CON(C<sub>3</sub>H<sub>7</sub>)<sub>2</sub>, CONHC<sub>4</sub>H<sub>9</sub>, CON(C<sub>4</sub>H<sub>9</sub>)<sub>2</sub>, and

-47-

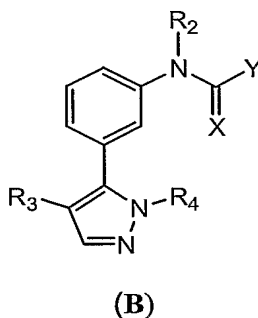
with the proviso that when any two adjacent positions of  $R_{13}$ ,  $R_{14}$ ,  $R_{15}$ ,  $R_{16}$  and  $R_{17}$  are substituted, said two adjacent positions can together be further selected from  $SCH_2S$ ,  $SCH_2CH_2S$ ,  $OCH_2O$ , or  $OCH_2CH_2O$  to form a bi-cyclic structure; and with the proviso that at least one of  $R_{13}$ ,  $R_{14}$ ,  $R_{15}$ ,  $R_{16}$  and  $R_{17}$  must be H.

5

**[0182]** In some embodiments of the foregoing genus (A), class (1), compounds of Example 13, Experiments 1-43, *infra*, and combinations or subcombinations thereof, are included.

**[0183]** In some embodiments of the foregoing genus (A), class (1), compounds of Example 13, Experiments 1-43, *infra*, and combinations or subcombinations thereof, are not included.

10 **[0184]** A more preferred series of compounds possessing 5-HT<sub>2A</sub> receptor activity that are useful as inverse agonists at such receptors is designated by the general Formula (B):



wherein:

15  $R_2$  is H or lower alkyl ( $C_{1-4}$ );

$R_3$  is Me, or Et, or halogen;

X is either Oxygen or Sulfur;

Y is  $NR_{15}R_{16}$ , or  $(CH_2)_mR_{17}$ , or  $O(CH_2)_nR_{17}$ ;

$R_4$  is lower alkyl ( $C_{1-6}$ );

20  $m=0-4$

$n=0-4$

$R_{15}$  is H or lower alkyl( $C_{1-4}$ );

$R_{16}$  and  $R_{17}$  are independently  $C_{1-6}$  alkyl, or  $C_{2-6}$  alkenyl, or cycloalkyl, or aryl group and each said group may be optionally substituted by up to four substituents in any position independently selected from  $CF_3$ ,  $CCl_3$ , Me,  $NO_2$ , OH, OMe, OEt,  $CONR_{18}R_{19}$ ,  $NR_{18}R_{19}$ ,  $NHCOCH_3$ ,  $OCF_3$ , SMe,  $COOR_{20}$ ,  $SO_3R_{20}$ ,  $SO_2NR_{18}R_{19}$ , COMe, COEt, CO-lower alkyl,  $SCF_3$ , CN,  $C_{2-6}$  alkenyl, H, halogens,  $C_{1-4}$  alkoxy,  $C_{3-6}$  cycloalkyl,  $C_{1-6}$  alkyl, aryl and aryloxy

25

wherein each of the C<sub>1-4</sub> alkoxy, C<sub>3-6</sub> cycloalkyl, C<sub>1-6</sub> alkyl, aryl and aryloxy groups may be further optionally substituted by up to four substituents in any position independently selected from CF<sub>3</sub>, CCl<sub>3</sub>, Me, NO<sub>2</sub>, OH, OMe, OEt, CONR<sub>21</sub>R<sub>22</sub>, NR<sub>21</sub>R<sub>22</sub>, NHCOCH<sub>3</sub>, OCF<sub>3</sub>, SMe, COOR<sub>23</sub>, SO<sub>3</sub>R<sub>23</sub>, SO<sub>2</sub>NR<sub>21</sub>R<sub>22</sub>, COMe, COEt, CO-lower alkyl, SCF<sub>3</sub>, CN, C<sub>2-6</sub> alkenyl, H, halogens, C<sub>1-4</sub> alkoxy, C<sub>3-6</sub> cycloalkyl, C<sub>1-6</sub> alkyl, and aryl;

R<sub>18</sub> and R<sub>19</sub> are independently a H or C<sub>1-6</sub> alkyl, or C<sub>2-6</sub> alkenyl, or cycloalkyl, or aryl, or CH<sub>2</sub> aryl group and each said group may be optionally substituted by up to four substituents in any position independently selected from CF<sub>3</sub>, CCl<sub>3</sub>, Me, NO<sub>2</sub>, OH, OMe, OEt, CONR<sub>21</sub>R<sub>22</sub>, NR<sub>21</sub>R<sub>22</sub>, NHCOCH<sub>3</sub>, OCF<sub>3</sub>, SMe, COOR<sub>23</sub>, SO<sub>3</sub>R<sub>23</sub>, SO<sub>2</sub>NR<sub>21</sub>R<sub>22</sub>, COMe, COEt, CO-lower alkyl, SCF<sub>3</sub>, CN, C<sub>2-6</sub> alkenyl, H, halogens, C<sub>1-4</sub> alkoxy, C<sub>3-6</sub> cycloalkyl, C<sub>1-6</sub> alkyl, and aryl

or R<sub>18</sub> and R<sub>19</sub> may form part of a 5, 6 or 7 membered cyclic structure which may be either saturated or unsaturated and that may contain up to four heteroatoms selected from O, N or S and said cyclic structure may be optionally substituted by up to four substituents in any position independently selected from CF<sub>3</sub>, CCl<sub>3</sub>, Me, NO<sub>2</sub>, OH, OMe, OEt, OCF<sub>3</sub>, SMe, COOR<sub>7</sub>, SO<sub>2</sub>NR<sub>24</sub>R<sub>25</sub>, SO<sub>3</sub>R<sub>26</sub>, NHCOCH<sub>3</sub>, COEt, COMe, or halogen;

R<sub>20</sub> and R<sub>23</sub> are each independently selected from H or C<sub>1-6</sub> alkyl;

R<sub>21</sub> and R<sub>22</sub> are each independently are independently a H, or C<sub>1-6</sub> alkyl, or C<sub>2-6</sub> alkenyl, or cycloalkyl, or aryl, or CH<sub>2</sub> aryl group and each said group may be optionally substituted by up to four substituents in any position independently selected from halogen, CF<sub>3</sub>, OCF<sub>3</sub>, OEt, CCl<sub>3</sub>, Me, NO<sub>2</sub>, OH, OMe, SMe, COMe, CN, COOR<sub>20</sub>, SO<sub>3</sub>R<sub>20</sub>, COEt, NHCOCH<sub>3</sub>, or aryl;

C<sub>1-6</sub> alkyl moieties can be straight chain or branched;

optionally substituted C<sub>1-6</sub> alkyl moieties can be straight chain or branched:

C<sub>2-6</sub> alkenyl moieties can be straight chain or branched; and

optionally substituted C<sub>2-6</sub> alkenyl moieties can be straight chain or branched.

**[0185]** Examples of suitable C<sub>1-6</sub> alkyl groups include but are not limited to methyl, ethyl, n-propyl, i-propyl, n-butyl, and t-butyl.

**[0186]** Halogens are typically F, Cl, Br, and I.

**[0187]** Examples of 5 or 6 membered ring moieties include, but are not restricted to, phenyl, furanyl, thienyl, imidazolyl, pyridyl, pyrrolyl, oxazolyl, isoxazolyl, triazolyl, pyrazolyl, tetrazolyl, thiazolyl and isothiazoyl. Examples of polycycle moieties include, but are not restricted to, naphthyl,

-49-

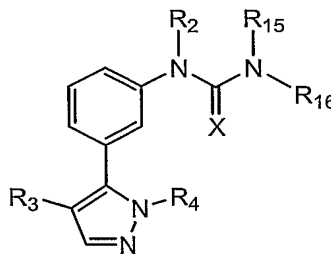
benzothiazolyl, benzofuranyl, benzimidazolyl, quinolyl, isoquinolyl, indolyl, quinoxaliny, quinazolinyl and benzothieryl.

**[0188]** In some embodiments of the foregoing genus (B), compounds of Example 13, Experiments 1-43, *infra*, and combinations or subcombinations thereof, are included.

5 **[0189]** In some embodiments of the foregoing genus (B), compounds of Example 13, Experiments 1-43, *infra*, and combinations or subcombinations thereof, are not included.

**[0190]** Exemplary compounds of general Formula (A), Class (1) are set forth below. Based upon *in vivo* data developed (as set forth below), Compounds **8** and **9** are particularly preferred.

10 **[0191]** A first series of compounds having 5-HT<sub>2A</sub> receptor activity is represented by a class (I) of compounds of Formula (B) wherein Y=NR<sub>15</sub>R<sub>16</sub> and is Formula (**B1**):



(**B1**)

wherein:

Preferably R<sub>2</sub> and R<sub>15</sub> are H;  
 Preferably R<sub>3</sub> is Br;  
 15 Preferably X is O;  
 Preferably R<sub>4</sub> is Me.

In some embodiments of the foregoing genus (B), class (1), compounds of Example 13, Experiments 1-43, *infra*, and combinations or subcombinations thereof, are included.

20 **[0192]** In some embodiments of the foregoing genus (B), class (1), compounds of Example 13, Experiments 1-43, *infra*, and combinations or subcombinations thereof, are not included.

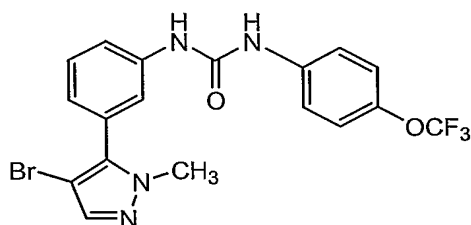
**[0193]** In reference to Formula (**B1**) R<sub>16</sub> is preferably 4-trifluoromethoxyphenyl, 4-trifluoromethoxybenzyl, 4-chlorophenyl or 4-fluorophenyl.

**[0194]** Certain preferred compounds are:

-50-

## Compound 7

N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)(((4-trifluoromethoxy)phenyl)aminocarboxamide

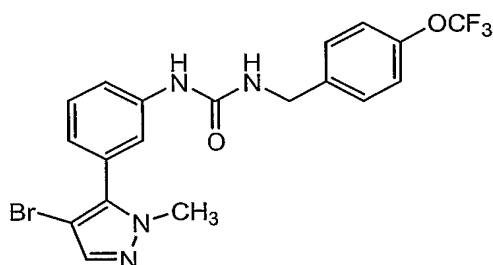


5

## Compound 10

N-(3-(4-bromo-2-methylpyrazol-3-yl)-phenyl)(((4-trifluoromethoxy)phenyl)methyl)

Aminocarboxamide



10

[0195] These two compounds demonstrated the following activities using the assay protocols defined in the Examples above:

15

TABLE 5

Compound Number	Competitive Binding AP-1 (( <sup>3</sup> H)mesulergine) IC <sub>50</sub> Value (μM)	Competitive Binding WT 5-HT <sub>2A</sub> (( <sup>3</sup> H)LSD) IC <sub>50</sub> Value (μM)	Inositol Phosphate Accumulation AP-3 IC <sub>50</sub> Value (μM)
Compound 7	2.1	.046	.052
Compound 10	1.2	.45	.0171



-51-

[0196] Additional compounds are set forth below. Inositol phosphate accumulation assays evidence the activity of test compounds. Both single concentration percentages of control values and IC<sub>50</sub> determinations indicate activity. In the tables below the column legends have the following meanings:

5        IP<sub>3</sub> % Control: The values in this column reflect an IP Accumulation Assay where the test compounds were evaluated at one concentration of 10 μM. For these assays, the compound was diluted into inositol-free Dulbecco's Eagle Media containing 10 μM pargyline and 10 mM LiCl and tested at a final assay concentration of 10 μM, in triplicate. The percent control value was calculated based on the control in which no test compound was added.

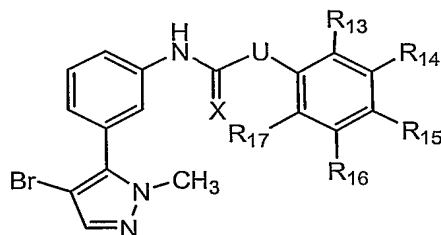
10       IP<sub>3</sub> AP-3 IC<sub>50</sub> nM: The values in this column reflect an IP accumulation assay in which the test compound was evaluated at several different concentrations whereby an IC<sub>50</sub> could be determined. This column corresponds to the column appearing in the tables above which is labeled: Inositol Phosphate Accumulation, AP-3, IC<sub>50</sub> Value (μM).

15       WT 5-HT<sub>2A</sub> LSD IC<sub>50</sub> nM: The values in this column reflect a competitive binding assay using LSD. This column corresponds to the column appearing in the tables above which is labeled: Competitive Binding, WT 5-HT<sub>2A</sub>, ((<sup>3</sup>H)LSD), IC<sub>50</sub> Value (μM).

[0197] Compounds listed in each of the following tables reference the structures immediately preceding the table. A "dash" in the table indicates that no value was determined.

-52-

TABLE 6



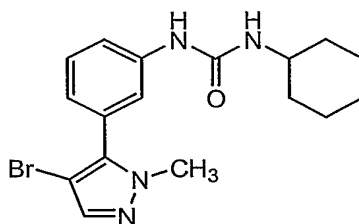
Compound Name									
Compound No.	R <sub>15</sub>	R <sub>14</sub>	R <sub>13</sub>	R <sub>16</sub>	X	U	IP <sub>3</sub> % of Control	IP <sub>3</sub> AP-3 IC <sub>50</sub> nM	WT 5-HT <sub>2A</sub> LSD IC <sub>50</sub> nM
N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)((4-methylthiophenyl)amino)carboxamide									
Compound 11	SCH <sub>3</sub>	H	H	H	O	NH	16	17	4
N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)((4-chlorophenyl)amino)carboxamide									
Compound 8	Cl	H	H	H	O	NH	10	3.2	11
((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)-amino)-N-(4-fluorophenyl)carboxamide									
Compound 9	F	H	H	H	O	NH	11	-	7
((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)-amino)-N-(2-(trifluoromethoxy)phenyl)carboxamide									
Compound 12	H	H	CF <sub>3</sub> O	H	O	NH	11	-	200
((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)-amino)-N-(2-nitrophenyl)carboxamide									
Compound 13	H	H	NO <sub>2</sub>	H	O	NH	27	-	238
((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)-amino)-N-(4-methoxyphenyl)carboxamide									
Compound 14	MeO	H	H	H	O	NH	12	-	19

((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(2-methylphenyl)carboxamide									
Compound 15	H	H	Me	H	O	NH	32	-	131
((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)-amino)-N-(4-(trifluoromethyl)phenyl)carboxamide									
Compound 16	CF <sub>3</sub>	H	H	H	O	NH	11	-	65
((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)-amino)-N-(3-chlorophenyl)carboxamide									
Compound 17	H	Cl	H	H	O	NH	11	-	39
((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)-amino)-N-(2-chlorophenyl)carboxamide									
Compound 18	H	H	Cl	H	O	NH	6	-	249
((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(4-(methylethyl)phenyl)carboxamide									
Compound 19	isopropyl	H	H	H	O	NH	7	-	338
((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)-amino)-N-(3-methoxyphenyl)carboxamide									
Compound 20	H	MeO	H	H	O	NH	7	-	106
((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)-amino)-N-(3-methylphenyl)carboxamide									
Compound 21	H	Me	H	H	O	NH	14	-	57
((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)-amino)-N-methyl-N-(4-(trifluoromethoxy)phenyl)carboxamide									
Compound 22	CF <sub>3</sub> O	H	H	H	O	NCH <sub>3</sub>	-	193	2
N-(4-(tert-butyl)phenyl)((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)carboxamide									
Compound 23	t-butyl	H	H	H	O	NH	17	-	476
N-(4-(dimethylamino)phenyl)((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)carboxamide									
Compound 24	NMe <sub>2</sub>	H	H	H	O	NH	9	-	309

-54-

N-(3,5-dichloro-4-methylphenyl)((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)carboxamide									
Compound 25	Me	Cl	H	Cl	O	NH	23	-	122
((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)-amino)-N-(4-(trifluoromethylthio)phenyl)carboxamide									
Compound 26	CF <sub>3</sub> S	H	H	H	O	NH	12	-	56
((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)-amino)-N-(2-fluorophenyl)carboxamide									
Compound 27	H	H	F	H	O	NH	12	-	37
2-(((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)-amino)carbonylamino)benzamide									
Compound 27	H	H	CONH <sub>2</sub>	H	O	NH	31	-	7473
((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)-amino)-N-(4-cyanophenyl)carboxamide									
Compound 29	CN	H	H	H	O	NH	12	-	2
((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)-amino)-N-(2-cyanophenyl)carboxamide									
Compound 30	H	H	CN	H	O	NH	30	-	348

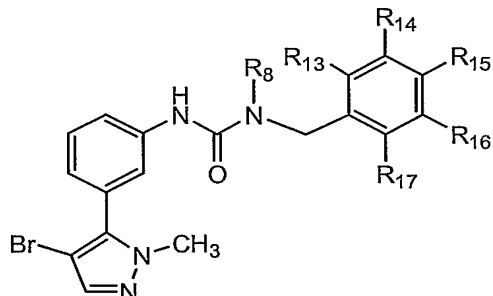
TABLE 7



Compound No.	N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)- (cyclohexylamino)carboxamide	IP <sub>3</sub> AP-3	WT 5-HT <sub>2A</sub> LSD
		IC <sub>50</sub> nM	IC <sub>50</sub> nM
Compound 31		114	81

-55-

TABLE 8



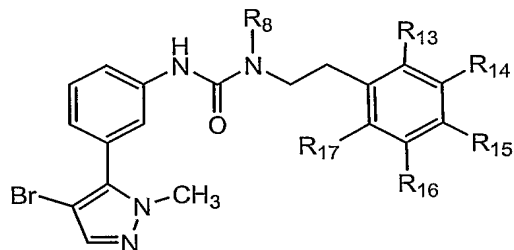
Compound Name							
Compound No.	R <sub>15</sub>	R <sub>14</sub>	R <sub>13</sub>	R <sub>16</sub>	R <sub>8</sub>	IP <sub>3</sub> AP-3 IC <sub>50</sub> nM	WT 5-HT <sub>2A</sub> LSD IC <sub>50</sub> nM
N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)-(phenylmethylamino)carboxamide							
Compound 32	H	H	H	H	H	120	47
N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)-(((4-fluorophenyl)methyl)amino)carboxamide							
Compound 33	F	H	H	H	H	89	132
N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)-(((3,4-dimethoxyphenyl)methyl)amino)-carboxamide							
Compound 34	OMe	OMe	H	H	H	-	1010
N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)-(((3,4,5-trimethoxyphenyl)methyl)amino)-carboxamide							
Compound 35	OMe	OMe	H	OMe	H	-	2960

-56-

N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)(((2-methylphenyl)methyl)amino)carboxamide							
Compound <b>36</b>	H	H	Me	H	H	-	769
N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)(((4-methoxyphenyl)methyl)amino)carboxamide							
Compound <b>37</b>	OMe	H	H	H	H	-	102

5

TABLE 9

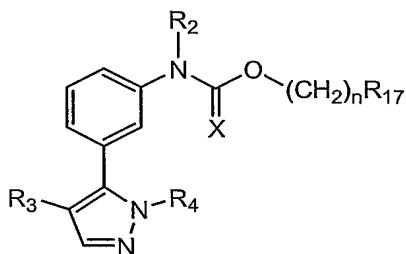


Compound Name							
Compound No.	R <sub>15</sub>	R <sub>14</sub>	R <sub>13</sub>	R <sub>16</sub>	R <sub>8</sub>	IP <sub>3</sub> AP-3 IC <sub>50</sub> nM	WT 5-HT <sub>2A</sub> LSD IC <sub>50</sub> nM
N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)((2-(4-methoxyphenyl)ethyl)amino)carboxamide							
Compound <b>38</b>	OMe	H	H	H	H	32	61

10

-57-

[0198] A second series of compounds having 5-HT<sub>2A</sub> receptor activity is represented by a class (II) of compounds of formula (B) wherein Y = O(CH<sub>2</sub>)<sub>n</sub>R<sub>17</sub>.



(B2)

wherein:

5 Preferably R<sub>2</sub> is H.

Preferably R<sub>3</sub> is Br.

Preferably X is O.

Preferably R<sub>4</sub> is Me.

Preferably when n = 0, R<sub>17</sub> is 4-methoxyphenyl or tertiary butyl.

10 In some embodiments of the foregoing genus (B), class (II), compounds of Example 13, Experiments 1-43, *infra*, and combinations or subcombinations thereof, are included.

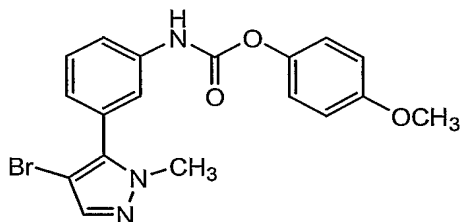
[0199] In some embodiments of the foregoing genus (B), class (II) compounds of Example 13, Experiments 1-43, *infra*, and combinations or subcombinations thereof, are not included.

[0200] Certain preferred compounds are: .

15

#### Compound 1

N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)(4-methoxyphenoxy)carboxamide

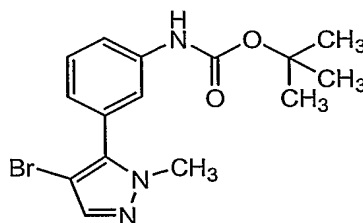


#### Compound 39

20

(tert-butoxy)-N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)carboxamide

-58-



[0201] Compounds **1** and **39** demonstrated the following activity as illustrated in TABLE 10:

TABLE 10

Compound Number	Competitive Binding AP-1 (( <sup>3</sup> H)mesulergine) IC <sub>50</sub> Value ( $\mu$ M)	Competitive Binding WT 5-HT <sub>2A</sub> (( <sup>3</sup> H)LSD) IC <sub>50</sub> Value ( $\mu$ M)	Inositol Phosphate Accumulation AP-3 IC <sub>50</sub> Value ( $\mu$ M)
Compound <b>1</b>	1.8	<0.001	0.0003
Compound <b>39</b>	-	0.014	0.057

5

[0202] In addition to the assays discussed above, the specific activity of Compound **1** at the 5-HT<sub>2A</sub> receptor was further confirmed by the following:

#### In Vitro Binding of 5-HT<sub>2A</sub> Receptor

#### 10 Animals:

[0203] Animals (Sprague-Dawley rats) were sacrificed and brains were rapidly dissected and frozen in isopentane maintained at -42° C. Horizontal sections were prepared on a cryostat and maintained at -20° C.

#### LSD Displacement Protocol:

15 [0204] Lysergic acid diethylamide (LSD) is a potent 5-HT<sub>2A</sub> receptor and dopamine D2 receptor ligand. An indication of the selectivity of compounds for either or both of these receptors involves displacement of radiolabeled-bound LSD from pre-treated brain sections. For these studies, radiolabeled I<sup>125</sup>-LSD (NEN Life Sciences, Boston, Mass., Catalogue number NEX-199) was utilized; spiperone (RBI, Natick, Mass. Catalogue number s-128) a 5-HT<sub>2A</sub> receptor and dopamine D2 receptor  
20 antagonist, was also utilized. Buffer consisted of 50 nanomolar TRIS-HCl, pH 7.4.



-59-

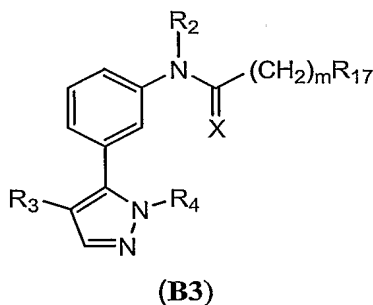
[0205] Brain sections were incubated in (a) Buffer plus 1 nanomolar  $I^{125}$ -LSD; (b) Buffer plus 1 nanomolar  $I^{125}$ -LSD and 1 micromolar spiperone; or Buffer plus 1 nanomolar  $I^{125}$ -LSD and 1 micromolar Compound 1 for 30 minutes at room temperature. Sections were then washed 2x 10 minutes at 4 ° C. in Buffer, followed by 20 seconds in distilled  $H_2O$ . Slides were then air-dried.

5 [0206] After drying, sections were apposed to x-ray film (Kodak Hyperfilm) and exposed for 4 days.

Analysis:

[0207] Figures 16A-C provide representative autoradiographic sections from this study. Figure 16A evidences darker bands (derived from  $I^{125}$ -LSD binding) primarily in both the fourth layer of the cerebral cortex (primarily 5-HT<sub>2A</sub> receptors), and the caudate nucleus (primarily dopamine D2 receptors and some 5-HT<sub>2A</sub> receptors). As can be seen from Figure 16B, spiperone, which is a 5-HT<sub>2A</sub> and dopamine D2 antagonist, displaces the  $I^{125}$ -LSD from these receptors on both the cortex and the caudate. As can be further seen from Figure 16C, Compound 1 appears to selectively displace the  $I^{125}$ -LSD from the cortex (5-HT<sub>2A</sub>) and not the caudate (dopamine D2).

15 [0208] A third series of compounds having 5-HT<sub>2A</sub> receptor activity is represented by a class (III) of compounds of Formula (B3) wherein  $Y=(CH_2)_mR_{17}$ :



wherein

20 Preferably  $R_2$  is H.  
 Preferably  $R_3$  is Br.  
 Preferably X is O.  
 Preferably  $R_4$  is Me.

[0209] Preferably when  $m=0$ ,  $R_{17}$  is preferably 4-trifluoromethoxyphenyl, or thiophene, or 4-chlorophenyl.

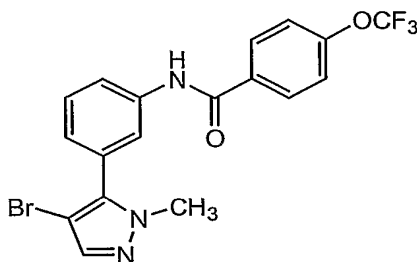
25 [0210] In some embodiments of the foregoing genus (B), class (III), compounds of Example 13, Experiments 1-43, *infra*, and combinations or subcombinations thereof, are included.

-60-

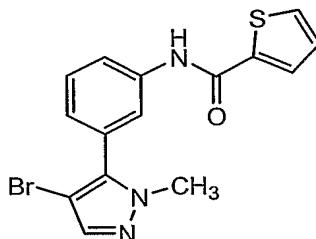
[0211] In some embodiments of the foregoing genus (B), class (III) compounds of Example 13, Experiments 1-43, *infra*, and combinations or subcombinations thereof, are not included.

[0212] Certain preferred compounds are:

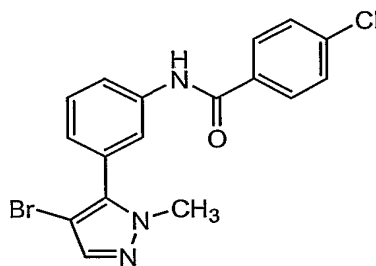
Compound 40 ( $m = 0$ ,  $R_2 = H$ ,  $R_{17} = 4$ -trifluoromethoxyphenyl)  
5 N-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-4-trifluoromethoxy-benzamide



10 Compound 2 ( $m=0$ ,  $R_2=H$ ,  $R_{17} = \text{thiophene}$ )  
Thiophene-2-carboxylic acid [3-(4-bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]amide



15 Compound 41 ( $m=0$ ,  $R_2=H$ ,  $R_{17} = \text{chlorophenyl}$ )  
N-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-4-chloro-benzamide



20

-61-

[0213] These three compounds demonstrated the following activities:

TABLE 11

Compound Number	Competitive Binding AP-1 ( <sup>3</sup> H)mesulergine IC <sub>50</sub> Value ( $\mu$ M)	Competitive Binding WT 5-HT <sub>2A</sub> ( <sup>3</sup> H)LSD) IC <sub>50</sub> Value ( $\mu$ M)	Inositol Phosphate Accumulation AP-3 IC <sub>50</sub> Value ( $\mu$ M)
Compound 40	6.1	.46	0.0213
Compound 2	2.8	.17	0.080
Compound 41	1.2	.21	0.0315

#### In Vivo Analysis of Compound 2

5 [0214] In addition to the in vitro assays shown in the above table, the in vivo response of animals to Compound 2 is demonstrated by the following.

[0215] A 5-HT<sub>2A</sub> receptor antagonist or inverse agonist is expected to decrease amphetamine-stimulated locomotion without affecting baseline locomotion. See, for example, Soresnon, et al, 266(2) J. Pharmacol. Exp. Ther. 684 (1993). Based upon the foregoing information, Compound 2 is a  
 10 potent inverse agonist at the human 5-HT<sub>2A</sub> receptor. For the following study, the following parameters and protocol were utilized:

#### Animals, Vehicle

[0216] Adult male Sprague-Dawley rats were utilized for these studies. Animals were housed in groups of 2-3 in hanging plastic cages with food and water available at all times. Animals  
 15 were weighed and handled for at least one day prior to surgery and throughout the studies. For these studies, Vehicle consisted of 90% ethanol (100%) and 10% water.

#### Amphetamine-Stimulated Locomotor Activity: Assessment and Apparatus

[0217] A San Diego Instruments Flex Field apparatus was used to quantify baseline and amphetamine-stimulated locomotor activity. This apparatus consists of four 16" x 16" clear plastic  
 20 open fields. Photocell arrays (16 in each dimension) interfaced with a personal computer to automatically quantify activity. Several measures of activity can be assessed with the apparatus, including total photocell beam breaks. Animals (vehicle control and Compound treated) were injected

-62-

s.c. 30 minutes prior to initiation of analysis. Following this 30 minute period, animals were placed individually into an open field and baseline activity was assessed for 30 minutes (habituation phase). Following baseline, animals were removed, injected with d-amphetamine sulfate (1.0 mg/kg) and immediately returned to the open field for 150 minutes, in order to follow the time course (10 minute intervals) of amphetamine-stimulated locomotor activity.

#### Dosing

**TABLE 12**

Vehicle Control	Compound 2	Dose (mg/kg)
6 animals	6 animals	0.1
	6 animals	1.0
	6 animals	5.0
	6 animals	10.0

#### Analysis

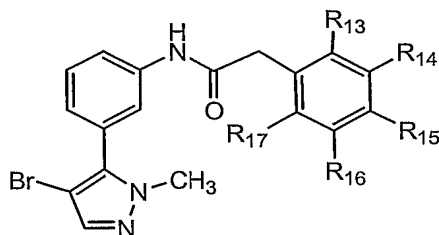
10 [0218] Results, based upon the number of recorded photobeam breaks (mean. $\pm$ sem), are presented in Figures 17A-C. As supported by Figures 17A, B and C, a general "inverted U" shaped pattern was observed (see, generally, Sahgal, A. "Practical behavioural neuroscience: problems, pitfalls and suggestions" pp 1-8, 5 in Behavioral Neuroscience: A Practical Approach, Volume 1 A. Sahgal (Ed.) 1993, IRL Press, New York). As Figure 17 also indicates, with exception of the highest

15 dose (10 mg/kg), in vivo, the tested doses of Compound 2 evidenced a decrease in the amphetamine-stimulated locomotion, consistent with a 5-HT<sub>2A</sub> receptor antagonist or inverse agonist.

[0219] Additional series of compounds of Formula (B) wherein Y=(CH<sub>2</sub>)<sub>m</sub>R<sub>17</sub> are set forth below in TABLE 13.

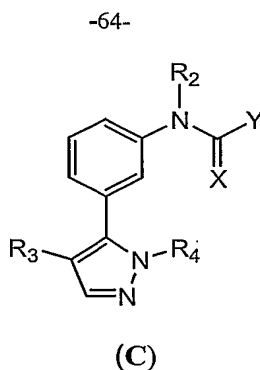
-63-

TABLE 13



Name	Compound No.	R <sub>15</sub>	R <sub>14</sub>	R <sub>13</sub>	R <sub>16</sub>	IP <sub>3</sub> AP-3 IC <sub>50</sub> nM	WT 5-HT <sub>2A</sub> LSD IC <sub>50</sub> nM
N-(3-(4-bromo-2-Methylpyrazol-3-yl)phenyl)-2-(4-(trifluoromethoxy)-phenyl)acetamide	Compound 42	OCF <sub>3</sub>	H	H	H	-	106
N-(3-(4-bromo-2-Methylpyrazol-3-yl)phenyl)-2-(3-Fluorophenyl)acetamide	Compound 43	H	F	H	H	153	318
N-(3-(4-bromo-2-Methylpyrazol-3-yl)phenyl)-2-(3-Methoxyphenyl)acetamide	Compound 44	H	OMe	H	H	108	625
N-(3-(4-bromo-2-Methylpyrazol-3-yl)phenyl)-2-(2-Fluorophenyl)acetamide	Compound 45	H	H	F	H	129	662
N-(3-(4-bromo-2-Methylpyrazol-3-yl)phenyl)-2-(4-Nitrophenyl)acetamide	Compound 46	NO <sub>2</sub>	H	H	H	61	108
N-(3-(4-bromo-2-Methylpyrazol-3-yl)phenyl)-2-(2-Methoxyphenyl)acetamide	Compound 47	H	H	OMe	H	165	2300

[0220] Based upon the discovery of the specific inverse agonist activity of the above  
 5 identified compounds at the 5-HT<sub>2A</sub> receptor, a novel class of compounds has been identified which  
 exhibits said activity. Accordingly, in the second aspect of the invention, there is provided a novel  
 compound of formula (C):



wherein:

$R^2$  is H or lower alkyl( $C_{1-4}$ );

$R_3$  is Me, or Et, or halogen;

5                   X is either Oxygen or Sulfur;

Y is  $NR_{15}R_{16}$ , or  $(CH_2)_m R_{17}$ , or  $O(CH_2)_n R_{17}$ ;

$R_4$  is lower alkyl ( $C_{1-6}$ );

$m=0-4$ ;

$n=0-4$ ;

10                   $R_{15}$  is H or lower alkyl( $C_{1-4}$ );

$R_{16}$  is a  $C_{1-6}$  alkyl, or  $C_{2-6}$  alkenyl, or cycloalkyl, or  $(CH_2)_k$  aryl group ( $k=1-4$ ), preferably  $k=1$ , and each said group may be optionally substituted by up to four substituents in any position independently selected from  $CF_3$ ,  $CCl_3$ , Me,  $NO_2$ , OH, OMe, OEt,  $CONR_{18}R_{19}$ ,  $NR_{18}R_{19}$ ,  $NHCOCH_3$ ,  $OCF_3$ , SMe,  $COOR_{20}$ ,  $SO_3R_{20}$ ,  $SO_2NR_{18}R_{19}$ , COMe, COEt, CO-lower alkyl,  $SCF_3$ , CN,  $C_{2-6}$  alkenyl, H, halogens,  $C_{1-4}$  alkoxy,  $C_{3-6}$  cycloalkyl,  $C_{1-6}$  alkyl, aryl and aryloxy wherein each of the  $C_{3-6}$  cycloalkyl,  $C_{1-6}$  alkyl, aryl and aryloxy may be further substituted by up to four substituents in any position independently selected from  $CF_3$ ,  $CCl_3$ , Me,  $NO_2$ , OH, OMe, OEt,  $CONR_{18}R_{19}$ ,  $NR_{18}R_{19}$ ,  $NHCOCH_3$ ,  $OCF_3$ , SMe,  $COOR_{20}$ ,  $SO_3R_{20}$ ,  $SO_2NR_{18}R_{19}$ , COMe, COEt, CO-lower alkyl,  $SCF_3$ , CN,  $C_{2-6}$  alkenyl, H, halogens,  $C_{1-4}$  alkoxy,  $C_{3-6}$  cycloalkyl,  $C_{1-6}$  alkyl, and aryl;

20                    $R_{18}$  and  $R_{19}$  are independently a H or  $C_{1-6}$  alkyl, or  $C_{2-6}$  alkenyl, or cycloalkyl, or aryl, or  $CH_2$  aryl group and each said group may be optionally substituted by up to four substituents in any position independently selected from  $CF_3$ ,  $CCl_3$ , Me,  $NO_2$ , OH, OMe, OEt,  $CONR_{21}R_{22}$ ,  $NR_{21}R_{22}$ ,  $NHCOCH_3$ ,  $OCF_3$ , SMe,  $COOR_{23}$ ,  $SO_3R_{23}$ ,  $SO_2NR_{21}R_{22}$ , COMe, COEt, CO-lower alkyl,  $SCF_3$ , CN,  $C_{2-6}$  alkenyl, H, halogens,  $C_{1-4}$  alkoxy,  $C_{3-6}$  cycloalkyl,  $C_{1-6}$  alkyl, and aryl wherein each of  $C_{3-6}$  cycloalkyl,  $C_{1-6}$  alkyl, and aryl groups may be further optionally substituted by up to four substituents in any position independently selected from  $CF_3$ ,  $CCl_3$ , Me,  $NO_2$ , OH, OMe, OEt,  $CONR_{21}R_{22}$ ,  $NR_{21}R_{22}$ ,  $NHCOCH_3$ ,  $OCF_3$ , SMe,  $COOR_{23}$ ,  $SO_3R_{23}$ ,  $SO_2NR_{21}R_{22}$ ,

-65-

COMe, COEt, CO-lower alkyl, SCF<sub>3</sub>, CN, C<sub>2-6</sub> alkenyl, H, halogens, C<sub>1-4</sub> alkoxy, C<sub>3-6</sub> cycloalkyl, C<sub>1-6</sub> alkyl, and aryl;

5 or R<sub>18</sub> and R<sub>19</sub> may form part of a 5, 6 or 7 membered cyclic structure which may be either saturated or unsaturated and that may contain up to four heteroatoms selected from O, N or S and said cyclic structure may be optionally substituted by up to four substituents in any position independently selected from CF<sub>3</sub>, CCl<sub>3</sub>, Me, NO<sub>2</sub>, OH, OMe, OEt, OCF<sub>3</sub>, SMe, COOR<sub>7</sub>, SO<sub>2</sub>NR<sub>21</sub>R<sub>22</sub>, SO<sub>3</sub>R<sub>23</sub>, NHCOCH<sub>3</sub>, COEt, COMe, or halogen;

10 R<sub>17</sub> is C<sub>1-6</sub> alkyl, or C<sub>2-6</sub> alkenyl, or cycloalkyl, or aryl, or CH<sub>2</sub> aryl group and each said group may be optionally substituted by up to four substituents in any position independently selected from CF<sub>3</sub>, CCl<sub>3</sub>, Me, NO<sub>2</sub>, OH, OMe, OEt, CONR<sub>21</sub>R<sub>22</sub>, NR<sub>21</sub>R<sub>22</sub>, NHCOCH<sub>3</sub>, OCF<sub>3</sub>, SMe, COOR<sub>23</sub>, SO<sub>3</sub>R<sub>23</sub>, SO<sub>2</sub>NR<sub>21</sub>R<sub>22</sub>, COMe, COEt, CO-lower alkyl, SCF<sub>3</sub>, CN, C<sub>2-6</sub> alkenyl, H, halogens, C<sub>1-4</sub> alkoxy, C<sub>3-6</sub> cycloalkyl, C<sub>1-6</sub> alkyl, and aryl wherein each of C<sub>3-6</sub> cycloalkyl, C<sub>1-6</sub> alkyl, and aryl groups may be further optionally substituted by up to four substituents in any position independently selected from CF<sub>3</sub>, CCl<sub>3</sub>, Me, NO<sub>2</sub>, OH, OMe, OEt, CONR<sub>21</sub>R<sub>22</sub>, NR<sub>21</sub>R<sub>22</sub>, NHCOCH<sub>3</sub>, OCF<sub>3</sub>, SMe, COOR<sub>23</sub>, SO<sub>3</sub>R<sub>23</sub>, SO<sub>2</sub>NR<sub>21</sub>R<sub>22</sub>, COMe, COEt, CO-lower alkyl, SCF<sub>3</sub>, CN, C<sub>2-6</sub> alkenyl, H, halogens, C<sub>1-4</sub> alkoxy, C<sub>3-6</sub> cycloalkyl, C<sub>1-6</sub> alkyl, and aryl;

R<sub>20</sub> and R<sub>23</sub> may be independently selected from H or C<sub>1-6</sub> alkyl;

20 R<sup>21</sup> and R<sup>22</sup> are independently a H, or C<sub>1-6</sub> alkyl, or C<sub>2-6</sub> alkenyl, or cycloalkyl, or aryl, or CH<sub>2</sub> aryl group and each said group may be optionally substituted by up to four substituents in any position independently selected from halogen, CF<sub>3</sub>, OCF<sub>3</sub>, OEt, CCl<sub>3</sub>, Me, NO<sub>2</sub>, OH, OMe, SMe, COMe, CN, COOR<sub>20</sub>, SO<sub>3</sub>R<sub>20</sub>, COEt, NHCOCH<sub>3</sub>, or aryl. An aryl moiety can be a 5 or 6 membered aromatic heterocyclic ring (containing up to 4 hetero atoms independently selected from N, O, or S) or a 6 membered aromatic non-heterocyclic ring or a polycycle;

C<sub>1-6</sub> alkyl moieties can be straight chain or branched;

optionally substituted C<sub>1-6</sub> alkyl moieties can be straight chain or branched;

C<sub>2-6</sub> alkenyl moieties can be straight chain or branched; and

optionally substituted C<sub>2-6</sub> alkenyl moieties can be straight chain or branched;

30 Examples of suitable C<sub>1-6</sub> alkyl groups include but are not limited to methyl, ethyl, n-propyl, i-propyl, n-butyl, and t-butyl.

[0221] Halogens are typically F, Cl, Br, and I.

[0222] Examples of 5 or 6 membered ring moieties include, but are not restricted to, phenyl, furanyl, thienyl, imidazolyl, pyridyl, pyrrolyl, oxazolyl, isoxazolyl, triazolyl, pyrazolyl, tetrazolyl,

-66-

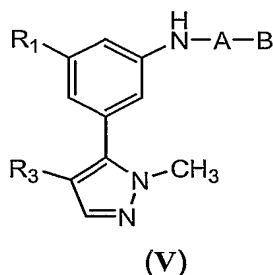
thiazolyl and isothiazolyl. Examples of polycycle moieties include, but are not restricted to, naphthyl, benzothiazolyl, benzofuranyl, benzimidazolyl, quinolyl, isoquinolyl, indolyl, quinoxaliny, quinazolinyl and benzothienyl.

**[0223]** In some embodiments of the foregoing genus (C), compounds of Example 13, Experiments 1-43, *infra*, and combinations or subcombinations thereof, are included.

**[0224]** In some embodiments of the foregoing genus (C), compounds of Example, Experiments 1-43, *infra*, and combinations or subcombinations thereof, are not included.

**[0225]** Some embodiments of the invention are compounds of Formula (V) and have one of the structures below.

TABLE 14



Cmpd	R <sub>1</sub>	R <sub>3</sub>	A	B
Compound Name				
48	H	Cl	C(=O)	-NH-(4-chlorophenyl)
1-[3-(4-Chloro-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(4-chloro-phenyl)-urea				
49	Cl	Cl	C(=O)	-NH-(4-chlorophenyl)
1-[3-Chloro-5-(4-chloro-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(4-chloro-phenyl)-urea				
50	H	Cl	C(=O)	-NH-(2,4-dichlorophenyl)
1-[3-(4-Chloro-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(2,4-dichloro-phenyl)-urea				
51	H	Cl	C(=O)	-NH-CH(CH <sub>3</sub> )-phenyl
1-[3-(4-Chloro-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(1-phenyl-ethyl)-urea				
52	H	Cl	C(=O)	-NH-(4-cyanophenyl)
1-[3-(4-Chloro-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(4-cyano-phenyl)-urea				



53	H	Cl	C(=O)	-NH-(4-dimethylaminophenyl
1-[3-(4-Chloro-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(4-dimethylamino-phenyl)-urea				
54	H	Cl	C(=O)	-NH-(4-ethoxycarbonyl)phenyl
4-{3-[3-(4-Chloro-2-methyl-2H-pyrazol-3-yl)-phenyl]-ureido}-benzoic acid ethyl ester				
55	H	Cl	C(=O)	-NH-(4-methylthio)phenyl
1-[3-(4-Chloro-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(4-methylsulfanyl-phenyl)-urea				
56	H	Cl	C(=O)	-NH-(4-isopropylphenyl)
1-[3-(4-Chloro-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(4-isopropyl-phenyl)-urea				
57	H	I	C(=O)	-NH-(4-chlorophenyl)
1-(4-Chloro-phenyl)-3-[3-(4-iodo-2-methyl-2H-pyrazol-3-yl)-phenyl]-urea				
58	H	Br	C(=O)	-O-ethyl
[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-carbamic acid ethyl ester				
59	H	Br	C(=O)	-O-(4-nitro)phenyl
[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-carbamic acid 4-nitro-phenyl ester				
60	H	Br	C(=O)	-O-CH <sub>2</sub> -fluorene-9-yl
[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-carbamic acid 9H-fluoren-9-ylmethyl ester				
61	H	Br	C(=O)	-O-CH <sub>2</sub> CH=CH <sub>2</sub>
[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-carbamic acid allyl ester				
62	H	Br	C(=O)	-O-(4-methyl)phenyl
[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-carbamic acid p-tolyl ester				
63	H	Br	C(=O)	-O-n-butyl
[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-carbamic acid butyl ester				
64	H	Br	C(=O)	-O-(2-isopropyl-5-methyl)cyclohex-1-yl
[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-carbamic acid 2-isopropyl-5-methyl-cyclohexyl ester				
65	H	Br	C(=O)	-O-benzyl
[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-carbamic acid benzyl ester				
66	H	Br	C(=O)	-O-(3-trifluoromethyl)phenyl
[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-carbamic acid 3-trifluoromethyl-phenyl ester				

67	H	Br	C(=O)	-O-(4-bromo)phenyl
[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-carbamic acid 4-bromo-phenyl ester				
68	H	Br	C(=O)	-O-(4-fluoro)phenyl
[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-carbamic acid 4-fluoro-phenyl ester				
69	H	Br	C(=O)	-O-(2-methoxy)phenyl
[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-carbamic acid 2-methoxy-phenyl ester				
70	H	Br	C(=O)	-O-(2-chloro)phenyl
[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-carbamic acid 2-chloro-phenyl ester				
71	H	Br	C(=O)	-O-C(CH <sub>3</sub> )=CH <sub>2</sub>
[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-carbamic acid isopropenyl ester				
72	H	Br	C(=O)	-O-1-(N-pyridinyl)ethyl
[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-carbamic acid 1-pyridin-1-yl-ethyl ester				
73	H	Br	C(=O)	-O-isopropyl
[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-carbamic acid isopropyl ester				
74	H	-C(=O)OCH <sub>3</sub>	C(=O)	-NH-(4-chlorophenyl)
5-{3-[3-(4-Chloro-phenyl)-ureido]-phenyl}-1-methyl-1H-pyrazole-4-carboxylic acid methyl ester				
75	H	-CH <sub>2</sub> CH <sub>2</sub> OH	C(=O)	-NH-(4-fluorophenyl)
1-(4-Fluoro-phenyl)-3-{3-[4-(2-hydroxy-ethyl)-2-methyl-2H-pyrazol-3-yl]-phenyl}-urea				
76	H	-CH <sub>2</sub> CH <sub>2</sub> N(Me) <sub>2</sub>	C(=O)	-NH-(4-fluorophenyl)
1-{3-[4-(2-Dimethylamino-ethyl)-2-methyl-2H-pyrazol-3-yl]-phenyl}-3-(4-fluoro-phenyl)-urea				
77	H	-CH=CH <sub>2</sub>	C(=O)	-NH-(4-chlorophenyl)
1-(4-Chloro-phenyl)-3-[3-(2-methyl-4-vinyl-2H-pyrazol-3-yl)-phenyl]-urea				
78	H	CH <sub>2</sub> CH <sub>3</sub>	C(=O)	-NH-(4-chlorophenyl)
1-(4-Chloro-phenyl)-3-[3-(4-ethyl-2-methyl-2H-pyrazol-3-yl)-phenyl]-urea				
79	H	-CH=CH <sub>2</sub>	C(=O)	-NH-(4-fluorophenyl)
1-(4-Fluoro-phenyl)-3-[3-(2-methyl-4-vinyl-2H-pyrazol-3-yl)-phenyl]-urea				
80	H	Phenyl	C(=O)	-NH-(4-chlorophenyl)
1-(4-Chloro-phenyl)-3-[3-(2-methyl-4-phenyl-2H-pyrazol-3-yl)-phenyl]-urea				
81	H	4-methoxyphenyl	C(=O)	-NH-(4-chlorophenyl)
1-(4-Chloro-phenyl)-3-{3-[4-(4-methoxy-phenyl)-2-methyl-2H-pyrazol-3-yl]-phenyl}-urea				
82	H	3-methoxyphenyl	C(=O)	-NH-(4-chlorophenyl)
1-(4-Chloro-phenyl)-3-{3-[4-(3-methoxy-phenyl)-2-methyl-2H-pyrazol-3-yl]-phenyl}-urea				

83	H	4-fluorophenyl	C(=O)	-NH-(4-chlorophenyl)
1-(4-Chloro-phenyl)-3-{3-[4-(4-fluoro-phenyl)-2-methyl-2H-pyrazol-3-yl]-phenyl}-urea				
84	H	4-trifluoro methoxyphenyl	C(=O)	-NH-(4-chlorophenyl)
1-(4-Chloro-phenyl)-3-{3-[2-methyl-4-(4-trifluoromethoxy-phenyl)-2H-pyrazol-3-yl]-phenyl}-urea				
85	H	Thiophen-2-yl	C(=O)	-NH-(4-chlorophenyl)
1-(4-Chloro-phenyl)-3-[3-(2-methyl-4-thiophen-2-yl-2H-pyrazol-3-yl)-phenyl]-urea				
86	H	-C(=O)-OH	C(=O)	-NH-(4-chlorophenyl)
5-{3-[3-(4-Chloro-phenyl)-ureido]-phenyl}-1-methyl-1H-pyrazole-4-carboxylic acid				
87	H	Cyclopropyl	C(=O)	-NH-(3- trifluoromethylphenyl)
1-[3-(4-Cyclopropyl-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(3-trifluoromethyl-phenyl)-urea				
88	H	Cyclopropyl	C(=O)	-NH-(3-chlorophenyl)
1-(3-Chloro-phenyl)-3-[3-(4-cyclopropyl-2-methyl-2H-pyrazol-3-yl)-phenyl]-urea				
89	H	Cyclopropyl	C(=O)	-NH-(2-methoxyphenyl)
1-[3-(4-Cyclopropyl-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(2-methoxy-phenyl)-urea				
90	H	-CCH	C(=O)	-NH-(4-chlorophenyl)
1-(4-Chloro-phenyl)-3-[3-(4-ethynyl-2-methyl-2H-pyrazol-3-yl)-phenyl]-urea				
91	H	-CH=CH-CCH	C(=O)	-NH-(4-chlorophenyl)
1-[3-(4-But-1-en-3-ynyl-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(4-chloro-phenyl)-urea				
92	H	-CH=CH-CCH	C(=O)	-NH-(4-methylphenyl)
1-[3-(4-But-1-en-3-ynyl-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-p-tolyl-urea				
93	H	CN	C(=O)	-NH-(4-chlorophenyl)
1-(4-Chloro-phenyl)-3-[3-(4-cyano-2-methyl-2H-pyrazol-3-yl)-phenyl]-urea				
94	H	CN	C(=O)	-NH-(4-isopropylphenyl)
1-[3-(4-Cyano-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(4-isopropyl-phenyl)-urea				
95	H	Cyclopropyl	C(=O)	-NH-(4-fluorophenyl)
1-[3-(4-Cyclopropyl-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(4-fluoro-phenyl)-urea				
96	F	Br	C(=O)	-NH-(4-chlorophenyl)
1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-fluoro-phenyl]-3-(4-chloro-phenyl)-urea				
97	F	Br	SO <sub>2</sub>	4-fluorophenyl
N-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-fluoro-phenyl]-4-fluoro-benzenesulfonamide				

-70-

98	F	Br	C(=O)	-NH-(4-bromophenyl)
1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-fluoro-phenyl]-3-(4-bromo-phenyl)-urea				
99	F	Br	C(=O)	-NH-(4-isopropylphenyl)
1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-fluoro-phenyl]-3-(4-isopropyl-phenyl)-urea				
100	F	Br	C(=O)	-NH-(4-fluorophenyl)
1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-fluoro-phenyl]-3-(4-fluoro-phenyl)-urea				
101	F	Br	C(=O)	-NH-(4-methoxyphenyl)
1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-fluoro-phenyl]-3-(4-methoxy-phenyl)-urea				
102	F	Br	C(=O)	-NH-(4-cyanophenyl)
1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-fluoro-phenyl]-3-(4-cyano-phenyl)-urea				
103	F	Br	SO <sub>2</sub>	4-chlorophenyl
N-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-fluoro-phenyl]-4-chloro-benzenesulfonamide				
104	F	Br	C(=O)	-NH-(2,4-dichlorophenyl)
1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-fluoro-phenyl]-3-(2,4-dichloro-phenyl)-urea				
105	-N(Me) <sub>2</sub>	Br	C(=O)	-NH-(4-bromophenyl)
1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-dimethylamino-phenyl]-3-(4-bromo-phenyl)-urea				
106	Pyrrolidin-1-yl	Br	C(=O)	-NH-CH(CH <sub>3</sub> )-phenyl
1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-pyrrolidin-1-yl-phenyl]-3-(1-phenyl-ethyl)-urea				
107	Morpholin-1-yl	Br	C(=O)	-NH-(2,4-dichlorophenyl)
1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-morpholin-4-yl-phenyl]-3-(2,4-dichloro-phenyl)-urea				
108	Pyrrolidin-1-yl	Br	C(=O)	Phenyl
N-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-pyrrolidin-1-yl-phenyl]-benzamide				
109	Pyrrolidin-1-yl	Br	C(=O)	-NH-(4-bromophenyl)
1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-pyrrolidin-1-yl-phenyl]-3-(4-bromo-phenyl)-urea				
110	Pyrrolidin-1-yl	Br	C(=O)	-NH-(4-dimethylaminophenyl)
1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-pyrrolidin-1-yl-phenyl]-3-(4-dimethylamino-phenyl)-urea				
111	Morpholin-1-yl	Br	C(=O)	-NH-(4-isopropylphenyl)
1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-morpholin-4-yl-phenyl]-3-(4-isopropyl-phenyl)-urea				

-71-

112	4-methylpiperazine-1-yl	Br	C(=O)	-NH-(4-bromophenyl)
1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-(4-methyl-piperazin-1-yl)-phenyl]-3-(4-bromophenyl)-urea				
113	-N(Me) <sub>2</sub>	Br	C(=O)	-NH-(4-chlorophenyl)
1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-dimethylamino-phenyl]-3-(4-chloro-phenyl)-urea				
114	4-methylpiperazine-1-yl	Br	C(=O)	-NH-(2-trifluoromethoxyphenyl)
1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-(4-methyl-piperazin-1-yl)-phenyl]-3-(2-trifluoromethoxy-phenyl)-urea				
115	Pyrrolidin-1-yl	Br	C(=S)	-NH-(4-methoxyphenyl)
1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-pyrrolidin-1-yl-phenyl]-3-(4-methoxy-phenyl)-thiourea				
116	4-methylpiperazine-1-yl	Br	C(=O)	-NH-(4-isopropylphenyl)
1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-(4-methyl-piperazin-1-yl)-phenyl]-3-(4-isopropyl-phenyl)-urea				
117	4-methylpiperazine-1-yl	Br	C(=O)	-NH-(4-chlorophenyl)
1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-(4-methyl-piperazin-1-yl)-phenyl]-3-(4-chloro-phenyl)-urea				
118	Pyrrolidin-1-yl	Br	SO <sub>2</sub>	4-fluorophenyl
N-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-pyrrolidin-1-yl-phenyl]-4-fluoro-benzenesulfonamide				
119	-N(Me) <sub>2</sub>	Br	SO <sub>2</sub>	4-chlorophenyl
N-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-dimethylamino-phenyl]-4-chloro-benzenesulfonamide				
120	Morpholin-1-yl	Br	C(=O)	-NH-(4-fluorophenyl)
1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-morpholin-4-yl-phenyl]-3-(4-fluoro-phenyl)-urea				
121	Morpholin-1-yl	Br	C(=O)	-NH-(4-chlorophenyl)
1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-morpholin-4-yl-phenyl]-3-(4-chloro-phenyl)-urea				
122	Pyrrolidin-1-yl	Br	C(=O)	-NH-(2,4-dichlorophenyl)
1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-pyrrolidin-1-yl-phenyl]-3-(2,4-dichloro-phenyl)-urea				

-72-

123	-N(Me) <sub>2</sub>	Br	C(=O)	-NH-(4-dimethylaminophenyl)
1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-dimethylamino-phenyl]-3-(4-dimethylamino-phenyl)-urea				
124	4-methylpiperazine-1-yl	Br	C(=O)	-NH-(4-fluorophenyl)
1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-(4-methyl-piperazin-1-yl)-phenyl]-3-(4-fluoro-phenyl)-urea				
125	Pyrrolidin-1-yl	Br	C(=O)	-NH-(4-methoxyphenyl)
1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-pyrrolidin-1-yl-phenyl]-3-(4-methoxy-phenyl)-urea				
126	Morpholin-1-yl	Br	C(=O)	-NH-(2-phenyl)cycloprop-1-yl
1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-morpholin-4-yl-phenyl]-3-(2-phenyl-cyclopropyl)-urea				
127	4-methylpiperazine-1-yl	Br	C(=O)	-NH-(4-cyanophenyl)
1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-(4-methyl-piperazin-1-yl)-phenyl]-3-(4-cyano-phenyl)-urea				
128	Morpholin-1-yl	Br	C(=O)	-NH-(4-cyanophenyl)
1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-morpholin-4-yl-phenyl]-3-(4-cyano-phenyl)-urea				
129	-N(Me) <sub>2</sub>	Br	C(=O)	-NH-(4-fluorophenyl)
1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-dimethylamino-phenyl]-3-(4-fluoro-phenyl)-urea				
130	-N(Me) <sub>2</sub>	Br	C(=O)	-NH-(4-isopropylphenyl)
1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-dimethylamino-phenyl]-3-(4-isopropyl-phenyl)-urea				
131	Pyrrolidin-1-yl	Br	C(=O)	-NH-(4-fluorophenyl)
1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-pyrrolidin-1-yl-phenyl]-3-(4-fluoro-phenyl)-urea				
132	4-methylpiperazine-1-yl	Br	C(=O)	-NH-(2-phenyl)cycloprop-1-yl
1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-(4-methyl-piperazin-1-yl)-phenyl]-3-(2-phenyl-cyclopropyl)-urea				
133	4-methylpiperazine-1-yl	Br	C(=O)	-NH-(2,4-dichlorophenyl)
1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-(4-methyl-piperazin-1-yl)-phenyl]-3-(2,4-dichloro-phenyl)-urea				

-73-

134	Morpholin-1-yl	Br	C(=O)	-NH-(4-trifluoromethylphenyl)
1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-morpholin-4-yl-phenyl]-3-(4-trifluoromethyl-phenyl)-urea				
135	Pyrrolidin-1-yl	Br	C(=O)	-NH-(3-amino-4-fluorophenyl)
1-(3-Amino-4-fluoro-phenyl)-3-[3-(4-bromo-2-methyl-2H-pyrazol-3-yl)-5-pyrrolidin-1-yl-phenyl]-urea				
136	-N(Me) <sub>2</sub>	Br	C(=O)	-NH-(4-methoxyphenyl)
1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-dimethylamino-phenyl]-3-(4-methoxy-phenyl)-urea				
137	Pyrrolidin-1-yl	Br	C(=O)	-NH-(3-nitro-4-fluorophenyl)
1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-pyrrolidin-1-yl-phenyl]-3-(4-fluoro-3-nitro-phenyl)-urea				
138	-N(Me) <sub>2</sub>	Br	C(=O)	-NH-(4-cyanophenyl)
1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-dimethylamino-phenyl]-3-(4-cyano-phenyl)-urea				
139	Pyrrolidin-1-yl	Br	C(=O)	-NH-CH(CH <sub>3</sub> )-phenyl
1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-pyrrolidin-1-yl-phenyl]-3-(1-phenyl-ethyl)-urea				
140	Pyrrolidin-1-yl	Br	C(=O)	-NH-(2-phenyl)cycloprop-1-yl
1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-pyrrolidin-1-yl-phenyl]-3-(2-phenyl-cyclopropyl)-urea				
141	Pyrrolidin-1-yl	Br	C(=O)	-NH-(4-chlorophenyl)
1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-pyrrolidin-1-yl-phenyl]-3-(4-chloro-phenyl)-urea				
142	Morpholin-1-yl	Br	C(=O)	-NH-(4-bromophenyl)
1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-morpholin-4-yl-phenyl]-3-(4-bromo-phenyl)-urea				
143	Pyrrolidin-1-yl	Br	C(=O)	-NH-(4-cyanophenyl)
1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-pyrrolidin-1-yl-phenyl]-3-(4-cyano-phenyl)-urea				
144	-N(Me) <sub>2</sub>	Br	SO <sub>2</sub>	4-fluorophenyl)
N-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-dimethylamino-phenyl]-4-fluoro-benzenesulfonamide				
145	Pyrrolidin-1-yl	Br	SO <sub>2</sub>	Phenyl
N-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-pyrrolidin-1-yl-phenyl]-benzenesulfonamide				
146	Morpholin-1-yl	Br	C(=O)	-NH-(4-methoxyphenyl)
1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-morpholin-4-yl-phenyl]-3-(4-methoxy-phenyl)-urea				

-74-

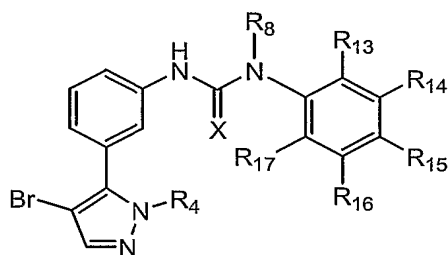
147	4-methylpiperazine-1-yl	Br	C(=O)	-NH-(4-dimethylaminophenyl)
1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-(4-methyl-piperazin-1-yl)-phenyl]-3-(4-dimethylamino-phenyl)-urea				
148	Pyrrolidin-1-yl	Br	C(=O)	-NH-(4-isopropylphenyl)
1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-pyrrolidin-1-yl-phenyl]-3-(4-isopropyl-phenyl)-urea				
149	-OMe	Br	C(=O)	-NH-(4-fluorophenyl)
1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-methoxy-phenyl]-3-(4-fluoro-phenyl)-urea				
150	-OH	Br	C(=O)	-NH-(3,5-dichlorophenyl)
1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-hydroxy-phenyl]-3-(3,5-dichloro-phenyl)-urea				
151	-OH	Br	C(=O)	-NH-(4-fluorophenyl)
1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-hydroxy-phenyl]-3-(4-fluoro-phenyl)-urea				
152	-OMe	Br	SO <sub>2</sub>	4-chlorophenyl
N-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-methoxy-phenyl]-4-chloro-benzenesulfonamide				
153	-OMe	Br	C(=O)	-NH-(4-dimethylaminophenyl)
1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-methoxy-phenyl]-3-(4-dimethylamino-phenyl)-urea				
154	-OMe	Br	C(=O)	-NH-(4-bromophenyl)
1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-methoxy-phenyl]-3-(4-bromo-phenyl)-urea				
155	-OH	Br	SO <sub>2</sub>	4-chlorophenyl
N-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-hydroxy-phenyl]-4-chloro-benzenesulfonamide				
156	-OMe	Br	C(=O)	-NH-(3,5-dichlorophenyl)
1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-methoxy-phenyl]-3-(3,5-dichloro-phenyl)-urea				
157	-OH	Br	C(=O)	-NH-(4-chlorophenyl)
1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-hydroxy-phenyl]-3-(4-chloro-phenyl)-urea				
158	-OMe	Br	C(=O)	-NH-(4-chlorophenyl)
1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-methoxy-phenyl]-3-(4-chloro-phenyl)-urea				
159	-OMe	Br	C(=O)	-NH-(2,4-dichlorophenyl)
1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-methoxy-phenyl]-3-(2,4-dichloro-phenyl)-urea				
160	Pyrrolidin-1-yl	Br	C(=O)	-NH-(4-trifluoromethyl)phenyl
1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-pyrrolidin-1-yl-phenyl]-3-(4-trifluoromethyl-phenyl)-urea				



-75-

161	-OH	Br	C(=O)	-NH-(4-methoxyphenyl)
1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-hydroxy-phenyl]-3-(4-methoxy-phenyl)-urea				
162	-OMe	Br	C(=O)	-NH-(4-methoxyphenyl)
1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-methoxy-phenyl]-3-(4-methoxy-phenyl)-urea				
163	-OH	Br	C(=O)	-NH-(4-cyanophenyl)
1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-hydroxy-phenyl]-3-(4-cyano-phenyl)-urea				
164	H	Br	C(=S)	-NH-(4-chlorophenyl)
1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(4-chloro-phenyl)-thiourea				

[0226] Also provided in accordance with the present invention are compounds useful as inverse agonists for 5-HT<sub>2A</sub> receptors having the structure:



5 wherein:

X is O or S;

R<sub>4</sub> is H or CH<sub>3</sub>;

R<sub>8</sub> and R<sub>30</sub> are each independently selected from H, C<sub>1-8</sub> straight chain or branched alkyl, C<sub>3-8</sub> cycloalkyl, C<sub>4-9</sub> alkylcycloalkyl, or C<sub>2-8</sub> alkenyl;

10 R<sub>15</sub> is H, F, Cl, Br, I, R<sub>20</sub>, CF<sub>3</sub>, CCl<sub>3</sub>, NR<sub>18</sub>R<sub>19</sub>, NR<sub>30</sub>COR<sub>20</sub>, NR<sub>30</sub>SO<sub>2</sub>R<sub>20</sub>, OR<sub>20</sub>, OCF<sub>3</sub>, OCOR<sub>20</sub>, OSO<sub>2</sub>R<sub>20</sub>, SR<sub>20</sub>, SCF<sub>3</sub>, SCOR<sub>20</sub>, SO<sub>3</sub>R<sub>20</sub>, SO<sub>2</sub>NR<sup>8</sup>R<sup>9</sup>, NO<sub>2</sub>, CN, COOR<sub>20</sub>, COSR<sub>20</sub>, or CONR<sub>18</sub>R<sub>19</sub>,

with the proviso that when a position adjacent to R<sub>15</sub> is substituted, then R<sub>15</sub> and said adjacent position can together be selected from SCH<sub>2</sub>S, SCH<sub>2</sub>CH<sub>2</sub>S, OCH<sub>2</sub>O, or OCH<sub>2</sub>CH<sub>2</sub>O to form a bi-cyclic structure;

15 R<sub>20</sub> is H, C<sub>1-8</sub> straight chain or branched alkyl, C<sub>3-8</sub> cycloalkyl, C<sub>4-9</sub> alkylcycloalkyl, C<sub>2-8</sub> alkenyl, aryl or alkylaryl;

20 R<sub>18</sub> and R<sub>19</sub> are each independently selected from: H, C<sub>1-8</sub> straight chain or branched alkyl, C<sub>2-8</sub> alkenyl or cycloalkyl, or alkylcycloalkyl, or aryl or CH<sub>2</sub>aryl wherein each moiety within said C<sub>1-8</sub> straight chain or branched alkyl, C<sub>2-8</sub> alkenyl or cycloalkyl, or alkylcycloalkyl, or aryl or CH<sub>2</sub>aryl may be optionally substituted by up to four substituents in any position, whereby each substituent is independently selected from: F, Cl, Br, I, CF<sub>3</sub>, CCl<sub>3</sub>, CH<sub>3</sub>, C<sub>2</sub>H<sub>5</sub>, C<sub>3</sub>H<sub>7</sub>, C<sub>4</sub>H<sub>9</sub>, NH<sub>2</sub>, NHCH<sub>3</sub>, N(CH<sub>3</sub>)<sub>2</sub>,

-76-

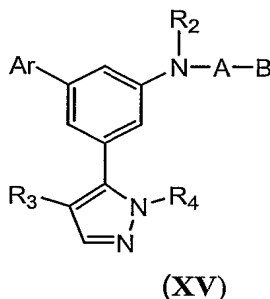
- NHC<sub>2</sub>H<sub>5</sub>, N(C<sub>2</sub>H<sub>5</sub>)<sub>2</sub>, NHC<sub>3</sub>H<sub>7</sub>, N(C<sub>3</sub>H<sub>7</sub>)<sub>2</sub>, NHC<sub>4</sub>H<sub>9</sub>, N(C<sub>4</sub>H<sub>9</sub>)<sub>2</sub>, NHCOH, NHCOCH<sub>3</sub>, NHCOC<sub>2</sub>H<sub>5</sub>,  
 NHCOC<sub>3</sub>H<sub>7</sub>, NHCOC<sub>4</sub>H<sub>9</sub>, NHSO<sub>2</sub>CH<sub>3</sub>, NHSO<sub>2</sub>C<sub>2</sub>H<sub>5</sub>, NHSO<sub>2</sub>C<sub>3</sub>H<sub>7</sub>, NHSO<sub>2</sub>C<sub>4</sub>H<sub>9</sub>, OH, OCH<sub>3</sub>, OC<sub>2</sub>H<sub>5</sub>,  
 OC<sub>3</sub>H<sub>7</sub>, OC<sub>4</sub>H<sub>9</sub>, OC<sub>5</sub>H<sub>11</sub>, OC<sub>6</sub>H<sub>13</sub>, OCF<sub>3</sub>, OCOCH<sub>3</sub>, OCOC<sub>2</sub>H<sub>5</sub>, OCOC<sub>3</sub>H<sub>7</sub>,  
 OCOC<sub>4</sub>H<sub>9</sub>, OSO<sub>2</sub>CH<sub>3</sub>, OSO<sub>2</sub>C<sub>2</sub>H<sub>5</sub>, OSO<sub>2</sub>C<sub>3</sub>H<sub>7</sub>, OSO<sub>2</sub>C<sub>4</sub>H<sub>9</sub>, SH, SCH<sub>3</sub>, SC<sub>2</sub>H<sub>5</sub>, SC<sub>3</sub>H<sub>7</sub>, SC<sub>4</sub>H<sub>9</sub>,  
 5 SC<sub>5</sub>H<sub>11</sub>, SC<sub>6</sub>H<sub>13</sub>, SCF<sub>3</sub>, SCOCH<sub>3</sub>, SCOC<sub>2</sub>H<sub>5</sub>, SCOC<sub>3</sub>H<sub>7</sub>, SCOC<sub>4</sub>H<sub>9</sub>, SO<sub>3</sub>CH<sub>3</sub>,  
 SO<sub>3</sub>C<sub>2</sub>H<sub>5</sub>, SO<sub>3</sub>C<sub>3</sub>H<sub>7</sub>, SO<sub>3</sub>C<sub>4</sub>H<sub>9</sub>, SO<sub>2</sub>NH, SO<sub>2</sub>NH<sub>2</sub>, SO<sub>2</sub>NHCH<sub>3</sub>, SO<sub>2</sub>N(CH<sub>3</sub>)<sub>2</sub>, SO<sub>2</sub>NHC<sub>2</sub>H<sub>5</sub>,  
 SO<sub>2</sub>N(C<sub>2</sub>H<sub>5</sub>)<sub>2</sub>, SO<sub>2</sub>NHC<sub>3</sub>H<sub>7</sub>, SO<sub>2</sub>N(C<sub>3</sub>H<sub>7</sub>)<sub>2</sub>, SO<sub>2</sub>NHC<sub>4</sub>H<sub>9</sub>, SO<sub>2</sub>N(C<sub>4</sub>H<sub>9</sub>)<sub>2</sub>, NO<sub>2</sub>, CN, COOCH<sub>3</sub>,  
 COOC<sub>2</sub>H<sub>5</sub>, COOC<sub>3</sub>H<sub>7</sub>, COOC<sub>4</sub>H<sub>9</sub>, COSCH<sub>3</sub>, COSC<sub>2</sub>H<sub>5</sub>, COSC<sub>3</sub>H<sub>7</sub>, COSC<sub>4</sub>H<sub>9</sub>, CONH<sub>2</sub>, CONHCH<sub>3</sub>,  
 CON(CH<sub>3</sub>)<sub>2</sub>, CONHC<sub>2</sub>H<sub>5</sub>, CON(C<sub>2</sub>H<sub>5</sub>)<sub>2</sub>, CONHC<sub>3</sub>H<sub>7</sub>, CON(C<sub>3</sub>H<sub>7</sub>)<sub>2</sub>, CONHC<sub>4</sub>H<sub>9</sub>, CON(C<sub>4</sub>H<sub>9</sub>)<sub>2</sub>,  
 10 with the proviso that when either of R<sub>18</sub> or R<sub>19</sub> contain an aryl ring substituted at at  
 least two adjacent positions on said aryl ring, then said two adjacent positions can  
 together be selected from SCH<sub>2</sub>S, SCH<sub>2</sub>CH<sub>2</sub>S, OCH<sub>2</sub>O, or OCH<sub>2</sub>CH<sub>2</sub>O to form a bi-  
 cyclic structure;  
 R<sub>13</sub>, R<sub>14</sub>, R<sub>15</sub>, R<sub>16</sub> and R<sub>17</sub> are each independently selected from the following: F, Cl, Br, I, CF<sub>3</sub>,  
 15 CCl<sub>3</sub>, CH<sub>3</sub>, C<sub>2</sub>H<sub>5</sub>, C<sub>3</sub>H<sub>7</sub>, C<sub>4</sub>H<sub>9</sub>, NH<sub>2</sub>, NHCH<sub>3</sub>, N(CH<sub>3</sub>)<sub>2</sub>, NHC<sub>2</sub>H<sub>5</sub>, N(C<sub>2</sub>H<sub>5</sub>)<sub>2</sub>, NHC<sub>3</sub>H<sub>7</sub>, N(C<sub>3</sub>H<sub>7</sub>)<sub>2</sub>,  
 NHC<sub>4</sub>H<sub>9</sub>, N(C<sub>4</sub>H<sub>9</sub>)<sub>2</sub>, NHCOH, NHCOCH<sub>3</sub>, NHCOC<sub>2</sub>H<sub>5</sub>, NHCOC<sub>3</sub>H<sub>7</sub>, NHCOC<sub>4</sub>H<sub>9</sub>, NHSO<sub>2</sub>CH<sub>3</sub>,  
 NHSO<sub>2</sub>C<sub>2</sub>H<sub>5</sub>, NHSO<sub>2</sub>C<sub>3</sub>H<sub>7</sub>, NHSO<sub>2</sub>C<sub>4</sub>H<sub>9</sub>, OH, OCH<sub>3</sub>, OC<sub>2</sub>H<sub>5</sub>, OC<sub>3</sub>H<sub>7</sub>, OC<sub>4</sub>H<sub>9</sub>, OC<sub>5</sub>H<sub>11</sub>,  
 OC<sub>6</sub>H<sub>13</sub>, OCF<sub>3</sub>, OCOCH<sub>3</sub>, OCOC<sub>2</sub>H<sub>5</sub>, OCOC<sub>3</sub>H<sub>7</sub>, OCOC<sub>4</sub>H<sub>9</sub>, OSO<sub>2</sub>CH<sub>3</sub>, OSO<sub>2</sub>C<sub>2</sub>H<sub>5</sub>,  
 OSO<sub>2</sub>C<sub>3</sub>H<sub>7</sub>, OSO<sub>2</sub>C<sub>4</sub>H<sub>9</sub>, SH, SCH<sub>3</sub>, SC<sub>2</sub>H<sub>5</sub>, SC<sub>3</sub>H<sub>7</sub>, SC<sub>4</sub>H<sub>9</sub>, SC<sub>5</sub>H<sub>11</sub>, SC<sub>6</sub>H<sub>13</sub>,  
 20 SCF<sub>3</sub>, SCOCH<sub>3</sub>, SCOC<sub>2</sub>H<sub>5</sub>, SCOC<sub>3</sub>H<sub>7</sub>, SCOC<sub>4</sub>H<sub>9</sub>, SO<sub>3</sub>CH<sub>3</sub>, SO<sub>3</sub>C<sub>2</sub>H<sub>5</sub>, SO<sub>3</sub>C<sub>3</sub>H<sub>7</sub>, SO<sub>3</sub>C<sub>4</sub>H<sub>9</sub>, SO<sub>2</sub>NH,  
 SO<sub>2</sub>NH<sub>2</sub>, SO<sub>2</sub>NHCH<sub>3</sub>, SO<sub>2</sub>N(CH<sub>3</sub>)<sub>2</sub>, SO<sub>2</sub>NHC<sub>2</sub>H<sub>5</sub>, SO<sub>2</sub>N(C<sub>2</sub>H<sub>5</sub>)<sub>2</sub>, SO<sub>2</sub>NHC<sub>3</sub>H<sub>7</sub>, SO<sub>2</sub>N(C<sub>3</sub>H<sub>7</sub>)<sub>2</sub>,  
 SO<sub>2</sub>NHC<sub>4</sub>H<sub>9</sub>, SO<sub>2</sub>N(C<sub>4</sub>H<sub>9</sub>)<sub>2</sub>, NO<sub>2</sub>, CN, COOCH<sub>3</sub>, COOC<sub>2</sub>H<sub>5</sub>, COOC<sub>3</sub>H<sub>7</sub>, COOC<sub>4</sub>H<sub>9</sub>, COSCH<sub>3</sub>,  
 COSC<sub>2</sub>H<sub>5</sub>, COSC<sub>3</sub>H<sub>7</sub>, COSC<sub>4</sub>H<sub>9</sub>, CONH<sub>2</sub>, CONHCH<sub>3</sub>, CON(CH<sub>3</sub>)<sub>2</sub>, CONHC<sub>2</sub>H<sub>5</sub>, CON(C<sub>2</sub>H<sub>5</sub>)<sub>2</sub>,  
 CONHC<sub>3</sub>H<sub>7</sub>, CON(C<sub>3</sub>H<sub>7</sub>)<sub>2</sub>, CONHC<sub>4</sub>H<sub>9</sub>, CON(C<sub>4</sub>H<sub>9</sub>)<sub>2</sub>, and  
 25 with the proviso that when any two adjacent positions of R<sub>13</sub>, R<sub>14</sub>, R<sub>15</sub>, R<sub>16</sub> and R<sub>17</sub> are  
 substituted, said two adjacent positions can together be further selected from SCH<sub>2</sub>S,  
 SCH<sub>2</sub>CH<sub>2</sub>S, OCH<sub>2</sub>O, or OCH<sub>2</sub>CH<sub>2</sub>O to form a bi-cyclic structure;  
 with the proviso that at least two of R<sub>13</sub>, R<sub>14</sub>, R<sub>15</sub>, R<sub>16</sub> and R<sub>17</sub> must be H.

[0227] In some embodiments of the foregoing genus, compounds of Example 13,  
 30 Experiments 1-43, *infra*, and combinations or subcombinations thereof, are included.

[0228] In some embodiments of the foregoing genus, compounds of Example 13,  
 Experiments 1-43, *infra*, and combinations or subcombinations thereof, are not included.

-77-

[0229] In some embodiments, compounds possessing 5-HT<sub>2A</sub> receptor activity that are useful as inverse agonists at such receptors are designated by the general Formula (XV):



5 wherein:

- i) Ar is a phenyl ring optionally substituted with up to five groups selected from the group consisting of halogen, OR<sub>7</sub>, OH, NR<sub>8</sub>R<sub>9</sub>, carboxy, CN, alkoxycarbonyl, straight chain or branched C<sub>1-6</sub> alkyl -C(p)<sub>3</sub>, or -O-C(p)<sub>3</sub> where p is halogen;

10 R<sub>8</sub> and R<sub>9</sub> are independently a H, or C<sub>1-6</sub> alkyl, or C<sub>2-6</sub> alkenyl, or cycloalkyl, or aryl, or CH<sub>2</sub> aryl group and each said group may be optionally substituted by up to four substituents in any position independently selected from halogen, CF<sub>3</sub>, OCF<sub>3</sub>, OEt, CCl<sub>3</sub>, Me, NO<sub>2</sub>, OH, OMe, SMe, COMe, CN, COOR<sub>10</sub>, SO<sub>3</sub>R<sub>10</sub>, COEt, NHCOCH<sub>3</sub>, or aryl; or

15 R<sub>8</sub> and R<sub>9</sub> may form part of a 5, 6 or 7 membered cyclic structure which may be either saturated or unsaturated and that may contain up to four heteroatoms selected from O, N or S and said cyclic structure may be optionally substituted by up to four substituents in any position independently selected from CF<sub>3</sub>, CCl<sub>3</sub>, Me, NO<sub>2</sub>, OH, OMe, OEt, OCF<sub>3</sub>, SMe, COOR<sub>10</sub>, SO<sub>2</sub>NR<sub>8</sub>R<sub>9</sub>, SO<sub>3</sub>R<sub>10</sub>, NHCOCH<sub>3</sub>, COEt, COMe, or halogen;

20 R<sub>7</sub> is H or C<sub>1-6</sub> alkyl;

R<sub>10</sub> is H or C<sub>1-6</sub> alkyl;

- ii) R<sub>2</sub> is H, straight chain or branched C<sub>1-6</sub> alkyl, C<sub>2-6</sub> alkenyl, or cycloalkyl;

25 iii) R<sub>3</sub> is halogen, carboxy, CN, alkoxycarbonyl, straight chain or branched C<sub>1-6</sub> alkyl, C<sub>2-6</sub> alkenyl, C<sub>2-6</sub> alkynyl, cycloalkyl, aryl or heteroaryl, wherein each of said alkoxycarbonyl, straight chain or branched C<sub>1-6</sub> alkyl, C<sub>2-6</sub> alkenyl, C<sub>2-6</sub> alkynyl, cycloalkyl, aryl or heteroaryl groups can be optionally substituted with up to four substituents in any position selected from OH, OR<sub>10</sub>, NR<sub>8</sub>R<sub>9</sub>, halogen, -C(p)<sub>3</sub>, or -O-C(p)<sub>3</sub> where p is halogen, and said cycloalkyl, aryl or heteroaryl groups can

-78-

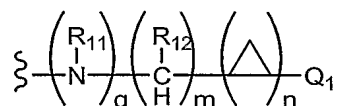
alternatively or additionally be optionally substituted with up to four alkyl substituents in any position;

iv)  $R_4$  is  $C_{1-6}$  alkyl,  $C_{2-6}$  alkenyl, or cycloalkyl;

v) A is  $C(=O)$ ,  $C(=S)$  or  $SO_2$ ;

5 vi) B is  $L_1$  or  $L_2$ ;

$L_1$  is:



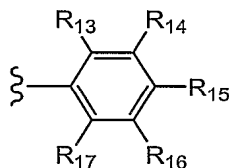
q is 0 or 1;

m is 0 or 1;

10 n is 0 or 1;

$R_{11}$  and  $R_{12}$  are each independently H, straight chain or branched  $C_{1-6}$  alkyl,  $C_{2-6}$  alkenyl, or cycloalkyl;

$Q_1$  is:



15 wherein:

$R_{13}$ ,  $R_{14}$ ,  $R_{15}$ ,  $R_{16}$  and  $R_{17}$  are each independently H, halogen, CN,  $NR_8R_9$ ,  $COOR_{10}$ ,  $SR_{10}$ , straight chain or branched  $C_{1-6}$  alkyl,  $C_{2-6}$  alkenyl,  $C_{2-6}$  alkynyl, cycloalkyl, aryl, alkylaryl, arylalkyl or heteroaryl, wherein each of said alkoxy carbonyl, straight chain or branched  $C_{1-6}$  alkyl,  $C_{2-6}$  alkenyl,  $C_{2-6}$  alkynyl, cycloalkyl, aryl, alkylaryl, arylalkyl or heteroaryl groups can be optionally substituted with up to four substituents in any position selected from  $NO_2$ ,  $OR_{10}$ ,  $NR_8R_9$ , halogen,  $-C(p)_3$ , or  $-O-C(p)_3$  where p is halogen, and said cycloalkyl, aryl, alkylaryl, arylalkyl or heteroaryl groups can alternatively or additionally be optionally substituted with up to four alkyl substituents in any position;

20

25

$L_2$  is  $-O-Q_2$  wherein  $Q_2$  is straight chain or branched  $C_{1-6}$  alkyl,  $C_{2-6}$  alkenyl,  $C_{2-6}$  alkynyl, cycloalkyl, aryl, alkylaryl, arylalkyl, wherein each of said cycloalkyl, aryl, alkylaryl, or arylalkyl groups can be optionally substituted with up to four substituents in any position selected from  $NO_2$ ,  $OR_7$ , halogen,  $-C(p)_3$ , or  $-O-C(p)_3$  where p is halogen, or an aliphatic or aromatic heterocycle, and said cycloalkyl, aryl,

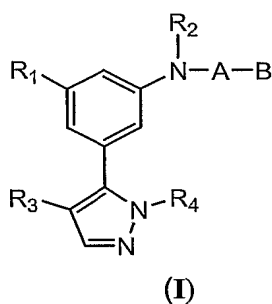
30

-79-

alkylaryl, and arylalkyl groups can alternatively or additionally be optionally substituted with up to four alkyl substituents in any position; or a pharmaceutically acceptable salt.

## 5 Methods

[0230] The present invention further provides methods for modulating the activity of a human 5-HT<sub>2A</sub> serotonin receptor by contacting the receptor with a compound of formula:



10 wherein:

i) R<sub>1</sub> is H, halogens, NR<sub>5</sub>R<sub>6</sub>, OH or OR<sub>7</sub>, wherein

R<sub>5</sub> and R<sub>6</sub> are independently H, or C<sub>1-6</sub> alkyl, or C<sub>2-6</sub> alkenyl, or cycloalkyl, or aryl, or CH<sub>2</sub> aryl group and each said group may be optionally substituted by up to four substituents in any position independently selected from CF<sub>3</sub>, CCl<sub>3</sub>, Me, NO<sub>2</sub>, OH, OMe, OEt, CONR<sub>8</sub>R<sub>9</sub>, NR<sub>8</sub>R<sub>9</sub>, NHCOCH<sub>3</sub>, OCF<sub>3</sub>, SMe, COOR<sub>10</sub>, SO<sub>3</sub>R<sub>8</sub>, SO<sub>2</sub>NR<sub>8</sub>R<sub>9</sub>, COMe, COEt, CO-lower alkyl, SCF<sub>3</sub>, CN, C<sub>2-6</sub> alkenyl, H, halogens, C<sub>1-4</sub> alkoxy, C<sub>3-6</sub> cycloalkyl, C<sub>1-6</sub> alkyl, and aryl wherein each of the C<sub>3-6</sub> cycloalkyl, C<sub>1-6</sub> alkyl, or aryl groups may be further optionally substituted by up to four substituents in any position independently selected from CF<sub>3</sub>, CCl<sub>3</sub>, Me, NO<sub>2</sub>, OH, OMe, OEt, CONR<sub>8</sub>R<sub>9</sub>, NR<sub>8</sub>R<sub>9</sub>, NHCOCH<sub>3</sub>, OCF<sub>3</sub>, SMe, COOR<sub>10</sub>, SO<sub>2</sub>NR<sub>8</sub>R<sub>9</sub>, SO<sub>3</sub>R<sub>10</sub>, COMe, COEt, CO-lower alkyl, SCF<sub>3</sub>, CN, C<sub>2-6</sub> alkenyl, H, halogens, C<sub>1-4</sub> alkoxy, C<sub>3-6</sub> cycloalkyl, C<sub>1-6</sub> alkyl, and aryl; or

R<sub>5</sub> and R<sub>6</sub> may form part of a 5, 6 or 7 membered cyclic structure which may be either saturated or unsaturated and that may contain up to four heteroatoms selected from O, N or S and said cyclic structure may be optionally substituted by up to four substituents in any position independently selected from CF<sub>3</sub>, CCl<sub>3</sub>, Me, NO<sub>2</sub>, OH, OMe, OEt, OCF<sub>3</sub>, SMe, COOR<sub>10</sub>, SO<sub>2</sub>NR<sub>8</sub>R<sub>9</sub>, SO<sub>3</sub>R<sub>10</sub>, NHCOCH<sub>3</sub>, COEt, COMe, or halogen;

-80-

$R_8$  and  $R_9$  are independently a H, or  $C_{1-6}$  alkyl, or  $C_{2-6}$  alkenyl, or cycloalkyl, or aryl, or  $CH_2$  aryl group and each said group may be optionally substituted by up to four substituents in any position independently selected from halogen,  $CF_3$ ,  $OCF_3$ ,  $OEt$ ,  $CCl_3$ ,  $Me$ ,  $NO_2$ ,  $OH$ ,  $OMe$ ,  $SMe$ ,  $COMe$ ,  $CN$ ,  $COOR_{10}$ ,  $SO_3R_{10}$ ,  $COEt$ ,  $NHCOCH_3$ , or aryl;

$R_{10}$  is H or  $C_{1-6}$  alkyl;

$R_7$  is H or  $C_{1-6}$  alkyl;

ii)  $R_2$  is H, straight chain or branched  $C_{1-6}$  alkyl,  $C_{2-6}$  alkenyl, or cycloalkyl;

iii)  $R_3$  is halogen, carboxy,  $CN$ , alkoxy carbonyl, straight chain or branched  $C_{1-6}$  alkyl,  $C_{2-6}$  alkenyl,  $C_{2-6}$  alkynyl, cycloalkyl, aryl or heteroaryl, wherein each of said alkoxy carbonyl, straight chain or branched  $C_{1-6}$  alkyl,  $C_{2-6}$  alkenyl,  $C_{2-6}$  alkynyl, cycloalkyl, aryl or heteroaryl groups can be optionally substituted with up to four substituents in any position selected from  $OH$ ,  $OR_{10}$ ,  $NR_8R_9$ , halogen,

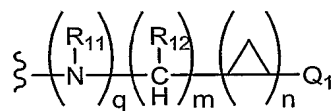
$-C(p)_3$ , or  $-O-C(p)_3$  where  $p$  is halogen, and said cycloalkyl, aryl or heteroaryl groups can alternatively or additionally be optionally substituted with up to four alkyl substituents in any position;

iv)  $R_4$  is  $C_{1-6}$  alkyl,  $C_{2-6}$  alkenyl, or cycloalkyl;

v)  $A$  is  $C(=O)$ ,  $C(=S)$  or  $SO_2$ ;

vi)  $B$  is  $L_1$  or  $L_2$ ;

$L_1$  is:



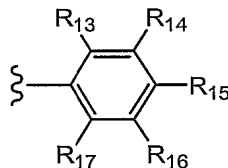
$q$  is 0 or 1;

$m$  is 0 or 1;

$n$  is 0 or 1;

$R_{11}$  and  $R_{12}$  are each independently H, straight chain or branched  $C_{1-6}$  alkyl,  $C_{2-6}$  alkenyl, or cycloalkyl;

$Q_1$  is:



wherein:

$R_{13}$ ,  $R_{14}$ ,  $R_{15}$ ,  $R_{16}$  and  $R_{17}$  are each independently H, halogen,  $CN$ ,  $NR_8R_9$ ,  $COOR_{10}$ ,  $SR_{10}$ , straight chain or branched  $C_{1-6}$  alkyl,  $C_{2-6}$  alkenyl,  $C_{2-6}$

-81-

5                   alkynyl, cycloalkyl, aryl, alkylaryl, arylalkyl or heteroaryl, wherein each of said alkoxycarbonyl, straight chain or branched C<sub>1-6</sub> alkyl, C<sub>2-6</sub> alkenyl, C<sub>2-6</sub> alkynyl, cycloalkyl, aryl, alkylaryl, arylalkyl or heteroaryl groups can be optionally substituted with up to four substituents in any position selected from NO<sub>2</sub>, OR<sub>10</sub>, NR<sub>8</sub>R<sub>9</sub>, halogen, -C(p)<sub>3</sub>, or -O-C(p)<sub>3</sub> where p is halogen, and said cycloalkyl, aryl, alkylaryl, arylalkyl or heteroaryl groups can alternatively or additionally be optionally substituted with up to four alkyl substituents in any position;

10                   L<sub>2</sub> is -O-Q<sub>2</sub> wherein Q<sub>2</sub> is straight chain or branched C<sub>1-6</sub> alkyl, C<sub>2-6</sub> alkenyl, C<sub>2-6</sub> alkynyl, cycloalkyl, aryl, alkylaryl, arylalkyl, wherein each of said cycloalkyl, aryl, alkylaryl, or arylalkyl groups can be optionally substituted with up to four substituents in any position selected from NO<sub>2</sub>, OR<sub>7</sub>, halogen, -C(p)<sub>3</sub>, or -O-C(p)<sub>3</sub> where p is halogen, or an aliphatic or aromatic heterocycle, and said cycloalkyl, aryl, 15                   alkylaryl, and arylalkyl groups can alternatively or additionally be optionally substituted with up to four alkyl substituents in any position; or a pharmaceutically acceptable salt.

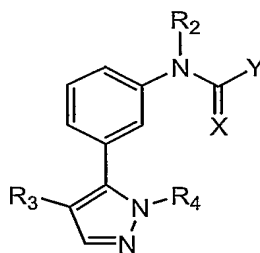
[0231]           An aryl moiety can be a 5 or 6 membered aromatic heterocyclic ring (containing up to 4 hetero atoms independently selected from N, O, or S) or a 6 membered aromatic non-heterocyclic 20                   ring or a polycycle.

[0232]           In some embodiments of the foregoing genus, compounds of Example 13, Experiments 1-43, *infra*, and combinations or subcombinations thereof, are included.

[0233]           In some embodiments of the foregoing genus, compounds of Example 13, Experiments 1-43, *infra*, and combinations or subcombinations thereof, are not included.

25                   [0234]           Also provided by the present invention are methods for modulating the activity of a human 5-HT<sub>2A</sub> serotonin receptor by contacting the receptor with a compound of formula:

-82-



(A)

wherein:

R<sub>2</sub> is H or lower alkyl(C<sub>1-4</sub>);

R<sub>3</sub> is lower alkyl (C<sub>1-6</sub>), or halogen;

5 R<sub>4</sub> is lower alkyl (C<sub>1-6</sub>);

X is either Oxygen or Sulfur;

Y is NR<sub>15</sub>R<sub>16</sub>, or (CH<sub>2</sub>)<sub>m</sub>R<sub>17</sub>, or O(CH<sub>2</sub>)<sub>n</sub>R<sub>17</sub>;

m=0-4

n=0-4

10 R<sub>15</sub> is H or lower alkyl(C<sub>1-4</sub>);

R<sub>16</sub> and R<sub>17</sub> are independently C<sub>1-6</sub> alkyl, or C<sub>2-6</sub> alkenyl, or cycloalkyl, or aryl, or CH<sub>2</sub> aryl group and each said group may be optionally substituted by up to four substituents in any position independently selected from CF<sub>3</sub>, CCl<sub>3</sub>, Me, NO<sub>2</sub>, OH, OMe, OEt, CONR<sub>18</sub>R<sub>19</sub>, NR<sub>18</sub>R<sub>19</sub>, NHCOCH<sub>3</sub>, OCF<sub>3</sub>, SMe, COOR<sub>20</sub>, SO<sub>3</sub>R<sub>20</sub>, SO<sub>2</sub>NR<sub>18</sub>R<sub>19</sub>, COMe, COEt, CO-lower alkyl, SCF<sub>3</sub>, CN, C<sub>2-6</sub> alkenyl, H, halogens, C<sub>1-4</sub> alkoxy, C<sub>3-6</sub> cycloalkyl, C<sub>1-6</sub> alkyl, and aryl;

15 R<sub>18</sub> and R<sub>19</sub> are independently a H or C<sub>1-6</sub> alkyl, or C<sub>2-6</sub> alkenyl, or cycloalkyl, or aryl, or CH<sub>2</sub> aryl group and each said group may be optionally substituted by up to four substituents in any position independently selected from CF<sub>3</sub>, CCl<sub>3</sub>, Me, NO<sub>2</sub>, OH, OMe, OEt, CONR<sub>21</sub>R<sub>22</sub>, NR<sub>21</sub>R<sub>22</sub>, NHCOCH<sub>3</sub>, OCF<sub>3</sub>, SMe, COOR<sub>23</sub>, SO<sub>3</sub>R<sub>23</sub>, SO<sub>2</sub>NR<sub>21</sub>R<sub>22</sub>, COMe, COEt, CO-lower alkyl, SCF<sub>3</sub>, CN, C<sub>2-6</sub> alkenyl, H, halogens, C<sub>1-4</sub> alkoxy, C<sub>3-6</sub> cycloalkyl, C<sub>1-6</sub> alkyl, and aryl;

20 or R<sub>18</sub> and R<sub>19</sub> may form part of a 5, 6 or 7 membered cyclic structure which may be either saturated or unsaturated and that may contain up to four heteroatoms selected from O, N or S and said cyclic structure may be optionally substituted by up to four substituents in any position independently selected from CF<sub>3</sub>, CCl<sub>3</sub>, Me, NO<sub>2</sub>, OH, OMe, OEt, OCF<sub>3</sub>, SMe, COOR<sub>23</sub>, SO<sub>2</sub>NR<sub>21</sub>R<sub>22</sub>, SO<sub>3</sub>R<sub>23</sub>, NHCOCH<sub>3</sub>, COEt, COMe, or halogen;

25 R<sub>20</sub> and R<sub>23</sub> are each independently selected from H or C<sub>1-6</sub> alkyl;



-83-

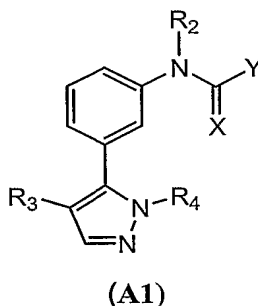
R<sub>21</sub> and R<sub>22</sub> are each independently are independently a H, or C<sub>1-6</sub> alkyl, or C<sub>2-6</sub> alkenyl, or cycloalkyl, or aryl, or CH<sub>2</sub> aryl group and each said group may be optionally substituted by up to four substituents in any position independently selected from halogen, CF<sub>3</sub>, OCF<sub>3</sub>, OEt, CCl<sub>3</sub>, Me, NO<sub>2</sub>, OH, OMe, SMe, COMe, CN, COOR<sub>20</sub>, SO<sub>3</sub>R<sub>20</sub>, COEt, NHCOCH<sub>3</sub>, or aryl;

an aryl moiety can be a 5 or 6 membered aromatic heterocyclic ring (containing up to 4 hetero atoms independently selected from N, O, or S) or a 6 membered aromatic non-heterocyclic ring or a polycycle.

[0235] In some embodiments of the foregoing genus, compounds of Example 13, Experiments 1-43, *infra*, and combinations or subcombinations thereof, are included.

[0236] In some embodiments of the foregoing genus, compounds of Example 13, Experiments 1-43, *infra*, and combinations or subcombinations thereof, are not included.

[0237] The present invention further provides methods for modulating the activity of a human 5-HT<sub>2A</sub> serotonin receptor by contacting the receptor with a compound of formula:



wherein:

R<sub>3</sub> is F, Cl, Br, I, C<sub>1-6</sub> straight chain or branched alkyl, C<sub>3-8</sub> cycloalkyl, C<sub>4-9</sub> alkylcycloalkyl, or C<sub>2-6</sub> alkenyl;

X is O or S;

Y is NR<sub>15</sub>R<sub>16</sub>, or (CH<sub>2</sub>)<sub>m</sub>R<sub>17</sub>, or O(CH<sub>2</sub>)<sub>n</sub>R<sub>17</sub>;

m is an integer between 0 and 4, inclusive;

n is an integer between 0 and 4, inclusive;

R<sub>4</sub> is H, C<sub>1-8</sub> straight chain or branched alkyl, C<sub>3-8</sub> cycloalkyl, C<sub>4-9</sub> alkylcycloalkyl, or C<sub>2-8</sub> alkenyl;

R<sub>2</sub> and R<sub>15</sub> are each independently selected from H, C<sub>1-8</sub> straight chain or branched alkyl, C<sub>3-8</sub> cycloalkyl, C<sub>4-9</sub> alkylcycloalkyl, or C<sub>2-8</sub> alkenyl;

-84-

$R_{16}$  and  $R_{17}$  is each independently selected from:  $C_{1-8}$  straight chain or branched alkyl,  $C_{2-8}$  alkenyl or cycloalkyl, or alkylcycloalkyl, or aryl, or  $CH_2$ aryl, wherein each moiety within said  $C_{1-8}$  straight chain or branched alkyl,  $C_{2-8}$  alkenyl or cycloalkyl, or alkylcycloalkyl, or aryl or  $CH_2$ aryl may be optionally substituted by up to four substituents in any position, whereby each substituent is

5 independently selected from: H, F, Cl, Br, I,  $R_{20}$ ,  $CF_3$ ,  $CF_2R_7$ ,  $CF_2CF_2$ ,  $CCl_3$ ,  $CCl_2R_7$ ,  $CCl_2CCl_2R_7$ ,  $NR_{18}R_{19}$ ,  $NR_{18}COR_{20}$ ,  $NR_{18}SO_2R_{20}$ ,  $OR_{20}$ ,  $OCF_3$ ,  $OCF_2R_{20}$ ,  $OCF_2CF_2R_{20}$ ,  $OCOR_{20}$ ,  $OSO_2R_{20}$ ,  $OPO(OR_{20})_2$ ,  $SR_{20}$ ,  $SCF_3$ ,  $SCF_2R_{20}$ ,  $SCF_2CF_2R_{20}$ ,  $SCOR_{20}$ ,  $SO_3R_{20}$ ,  $SO_2NR_{18}R_{19}$ ,  $PO(OR_{20})_3$ ,  $PO(OR_{20})_2R_{20}$ ,  $NO_2$ , CN,  $CNR_{20}(NR_{18}R_{19})$ ,  $CNR_{18}(SR_{20})$ ,  $COOR_{20}$ ,  $COSR_{20}$ ,  $CONR_{18}R_{19}$ ,

with the proviso that when  $R_{16}$  or  $R_{17}$  contains an aryl ring substituted at at least two adjacent positions on said aryl ring, then said two adjacent positions can together be

10 selected from  $SCH_2S$ ,  $SCH_2CH_2S$ ,  $OCH_2O$ , or  $OCH_2CH_2O$  to form a bi-cyclic structure;

$R_{20}$  is H,  $C_{1-8}$  straight chain or branched alkyl,  $C_{3-8}$  cycloalkyl,  $C_{4-9}$  alkylcycloalkyl,  $C_{2-8}$  alkenyl, aryl or alkylaryl;

15  $R_{18}$  and  $R_{19}$  are each independently selected from H,  $C_{1-8}$  straight chain or branched alkyl,  $C_{2-8}$  alkenyl or cycloalkyl, or alkylcycloalkyl, or aryl, or  $CH_2$ aryl, wherein each moiety within said  $C_{1-8}$  straight chain or branched alkyl,  $C_{2-8}$  alkenyl or cycloalkyl, or alkylcycloalkyl, or aryl or  $CH_2$ aryl may be optionally substituted by up to four substituents in any position, whereby each substituent is independently selected from: F, Cl, Br, I,  $CF_3$ ,  $CCl_3$ ,  $CH_3$ ,  $C_2H_5$ ,  $C_3H_7$ ,  $C_4H_9$ ,  $NH_2$ ,  $NHCH_3$ ,  $N(CH_3)_2$ ,

20  $NHC_2H_5$ ,  $N(C_2H_5)_2$ ,  $NHC_3H_7$ ,  $N(C_3H_7)_2$ ,  $NHC_4H_9$ ,  $N(C_4H_9)_2$ ,  $NHCOH$ ,  $NHCOCH_3$ ,  $NHCOC_2H_5$ ,  $NHCOC_3H_7$ ,  $NHCOC_4H_9$ ,  $NHSO_2CH_3$ ,  $NHSO_2C_2H_5$ ,  $NHSO_2C_3H_7$ ,  $NHSO_2C_4H_9$ ,  $OH$ ,  $OCH_3$ ,  $OC_2H_5$ ,  $OC_3H_7$ ,  $OC_4H_7$ ,  $OC_4H_9$ ,  $OC_5H_9$ ,  $OC_5H_{11}$ ,  $OC_6H_{11}$ ,  $OC_6H_{13}$ ,  $OCF_3$ ,  $OCOCH_3$ ,  $OCOC_2H_5$ ,  $OCOC_3H_7$ ,  $OCOC_4H_9$ ,  $OSO_2CH_3$ ,  $OSO_2C_2H_5$ ,  $OSO_2C_3H_7$ ,  $OSO_2C_4H_9$ ,  $SH$ ,  $SCH_3$ ,  $SC_2H_5$ ,  $SC_3H_7$ ,  $SC_4H_7$ ,  $SC_4H_9$ ,  $SC_5H_9$ ,  $SC_5H_{11}$ ,  $SC_6H_{11}$ ,  $SC_6H_{13}$ ,  $SCF_3$ ,  $SCOCH_3$ ,  $SCOC_2H_5$ ,  $SCOC_3H_7$ ,  $SCOC_4H_9$ ,  $SO_3CH_3$ ,

25  $SO_3C_2H_5$ ,  $SO_3C_3H_7$ ,  $SO_3C_4H_9$ ,  $SO_2NH$ ,  $SO_2NH_2$ ,  $SO_2NHCH_3$ ,  $SO_2N(CH_3)_2$ ,  $SO_2NHC_2H_5$ ,  $SO_2N(C_2H_5)_2$ ,  $SO_2NHC_3H_7$ ,  $SO_2N(C_3H_7)_2$ ,  $SO_2NHC_4H_9$ ,  $SO_2N(C_4H_9)_2$ ,  $NO_2$ , CN,  $COOCH_3$ ,  $COOC_2H_5$ ,  $COOC_3H_7$ ,  $COOC_4H_9$ ,  $COSCH_3$ ,  $COSC_2H_5$ ,  $COSC_3H_7$ ,  $COSC_4H_9$ ,  $CONH_2$ ,  $CONHCH_3$ ,  $CON(CH_3)_2$ ,  $CONHC_2H_5$ ,  $CON(C_2H_5)_2$ ,  $CONHC_3H_7$ ,  $CON(C_3H_7)_2$ ,  $CONHC_4H_9$ ,  $CON(C_4H_9)_2$ , and

with the proviso that when either or both of  $R_{18}$  or  $R_{19}$  contain an aryl ring substituted at at least two adjacent positions on said aryl ring, then said two adjacent positions can together be selected from  $SCH_2S$ ,  $SCH_2CH_2S$ ,  $OCH_2O$ , or  $OCH_2CH_2O$  to form a bi-cyclic structure;

30

or

$R_{18}$  or  $R_{19}$  may together form part of a 5, 6 or 7 membered cyclic structure, with said structure

35 being saturated or unsaturated, and further with said structure containing up to four heteroatoms

-85-

selected from O, N or S, and further wherein each moiety within said cyclic structure being optionally substituted by up to four substituents in any position independently selected from: F, Cl, Br, I, CF<sub>3</sub>, CCl<sub>3</sub>, CH<sub>3</sub>, C<sub>2</sub>H<sub>5</sub>, C<sub>3</sub>H<sub>7</sub>, C<sub>4</sub>H<sub>9</sub>, NH<sub>2</sub>, NHCH<sub>3</sub>, N(CH<sub>3</sub>)<sub>2</sub>, NHC<sub>2</sub>H<sub>5</sub>, N(C<sub>2</sub>H<sub>5</sub>)<sub>2</sub>, NHC<sub>3</sub>H<sub>7</sub>, N(C<sub>3</sub>H<sub>7</sub>)<sub>2</sub>, NHC<sub>4</sub>H<sub>9</sub>, N(C<sub>4</sub>H<sub>9</sub>)<sub>2</sub>, NHCOH, NHCOCH<sub>3</sub>, NHCOC<sub>2</sub>H<sub>5</sub>, NHCOC<sub>3</sub>H<sub>7</sub>, NHCOC<sub>4</sub>H<sub>9</sub>, NHSO<sub>2</sub>CH<sub>3</sub>, NHSO<sub>2</sub>C<sub>2</sub>H<sub>5</sub>, NHSO<sub>2</sub>C<sub>3</sub>H<sub>7</sub>, NHSO<sub>2</sub>C<sub>4</sub>H<sub>9</sub>, OH, OCH<sub>3</sub>, OC<sub>2</sub>H<sub>5</sub>, OC<sub>3</sub>H<sub>7</sub>, OC<sub>4</sub>H<sub>9</sub>, OC<sub>5</sub>H<sub>9</sub>, OC<sub>6</sub>H<sub>11</sub>, OC<sub>6</sub>H<sub>13</sub>, OCF<sub>3</sub>, OCOCH<sub>3</sub>, OCOC<sub>2</sub>H<sub>5</sub>, OCOC<sub>3</sub>H<sub>7</sub>, OCOC<sub>4</sub>H<sub>9</sub>, OSO<sub>2</sub>CH<sub>3</sub>, OSO<sub>2</sub>C<sub>2</sub>H<sub>5</sub>, OSO<sub>2</sub>C<sub>3</sub>H<sub>7</sub>, OSO<sub>2</sub>C<sub>4</sub>H<sub>9</sub>, SH, SCH<sub>3</sub>, SC<sub>2</sub>H<sub>5</sub>, SC<sub>3</sub>H<sub>7</sub>, SC<sub>4</sub>H<sub>9</sub>, SC<sub>5</sub>H<sub>9</sub>, SC<sub>5</sub>H<sub>11</sub>, SC<sub>6</sub>H<sub>11</sub>, SC<sub>6</sub>H<sub>13</sub>, SCF<sub>3</sub>, SCOCH<sub>3</sub>, SCOC<sub>2</sub>H<sub>5</sub>, SCOC<sub>3</sub>H<sub>7</sub>, SCOC<sub>4</sub>H<sub>9</sub>, SO<sub>3</sub>CH<sub>3</sub>, SO<sub>3</sub>C<sub>2</sub>H<sub>5</sub>, SO<sub>3</sub>C<sub>3</sub>H<sub>7</sub>, SO<sub>3</sub>C<sub>4</sub>H<sub>9</sub>, SO<sub>2</sub>NH, SO<sub>2</sub>NH<sub>2</sub>, SO<sub>2</sub>NHCH<sub>3</sub>, SO<sub>2</sub>N(CH<sub>3</sub>)<sub>2</sub>, SO<sub>2</sub>NHC<sub>2</sub>H<sub>5</sub>, SO<sub>2</sub>N(C<sub>2</sub>H<sub>5</sub>)<sub>2</sub>, SO<sub>2</sub>NHC<sub>3</sub>H<sub>7</sub>, SO<sub>2</sub>N(C<sub>3</sub>H<sub>7</sub>)<sub>2</sub>, SO<sub>2</sub>NHC<sub>4</sub>H<sub>9</sub>, SO<sub>2</sub>N(C<sub>4</sub>H<sub>9</sub>)<sub>2</sub>, NO<sub>2</sub>, CN, COOCH<sub>3</sub>, COOC<sub>2</sub>H<sub>5</sub>, COOC<sub>3</sub>H<sub>7</sub>, COOC<sub>4</sub>H<sub>9</sub>, COSCH<sub>3</sub>, COSC<sub>2</sub>H<sub>5</sub>, COSC<sub>3</sub>H<sub>7</sub>, COSC<sub>4</sub>H<sub>9</sub>, CONH<sub>2</sub>, CONHCH<sub>3</sub>, CON(CH<sub>3</sub>)<sub>2</sub>, CONHC<sub>2</sub>H<sub>5</sub>, CON(C<sub>2</sub>H<sub>5</sub>)<sub>2</sub>, CONHC<sub>3</sub>H<sub>7</sub>, CON(C<sub>3</sub>H<sub>7</sub>)<sub>2</sub>, CONHC<sub>4</sub>H<sub>9</sub>, CON(C<sub>4</sub>H<sub>9</sub>)<sub>2</sub>, and

with the proviso that wherein when R<sub>18</sub> or R<sub>19</sub> form an aryl ring substituted at at least two adjacent positions on said aryl ring, then said two adjacent positions can together be selected from SCH<sub>2</sub>S, SCH<sub>2</sub>CH<sub>2</sub>S, OCH<sub>2</sub>O, or OCH<sub>2</sub>CH<sub>2</sub>O to form a bi-cyclic structure.

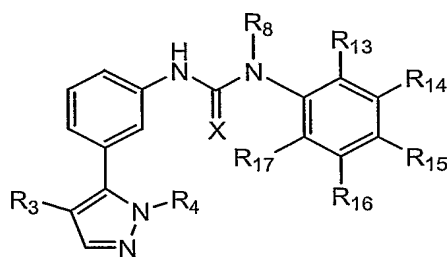
**[0238]** An aryl moiety can be a 5 or 6 membered aromatic heterocyclic ring (containing up to 4 hetero atoms independently selected from N, O, or S) or a 6 membered aromatic non-heterocyclic ring or a polycycle.

**[0239]** In some embodiments of the foregoing genus, compounds of Example 13, Experiments 1-43, *infra*, and combinations or subcombinations thereof, are included.

**[0240]** In some embodiments of the foregoing genus, compounds of Example 13, Experiments 1-43, *infra*, and combinations or subcombinations thereof, are not included.

**[0241]** Also provided by the present invention are methods for modulating the activity of a human 5-HT<sub>2A</sub> serotonin receptor by contacting the receptor with a compound of formula:

-86-



(A2)

wherein:

X is O or S;

R<sub>4</sub> is H or CH<sub>3</sub>;

5 R<sub>8</sub> and R<sub>20</sub> are each independently selected from H, C<sub>1-8</sub> straight chain or branched alkyl, C<sub>3-8</sub> cycloalkyl, C<sub>4-9</sub> alkylcycloalkyl, or C<sub>2-8</sub> alkenyl;

R<sub>15</sub> is H, F, Cl, Br, I, R<sub>20</sub>, CF<sub>3</sub>, CF<sub>2</sub>R<sub>20</sub>, CF<sub>2</sub>CF<sub>2</sub>, CCl<sub>3</sub>, CCl<sub>2</sub>R<sub>20</sub>, CCl<sub>2</sub>CCl<sub>2</sub>R<sub>20</sub>, NR<sub>18</sub>R<sub>19</sub>, NR<sub>19</sub>COR<sub>20</sub>, NR<sub>19</sub>SO<sub>2</sub>R<sub>20</sub>, OR<sub>20</sub>, OCF<sub>3</sub>, OCF<sub>2</sub>R<sub>20</sub>, OCF<sub>2</sub>CF<sub>2</sub>R<sub>20</sub>, OCOR<sub>20</sub>, OSO<sub>2</sub>R<sub>20</sub>, OPO(OR<sub>20</sub>)<sub>2</sub>, SR<sub>20</sub>, SCF<sub>3</sub>, SCF<sub>2</sub>R<sub>20</sub>, SCF<sub>2</sub>CF<sub>2</sub>R<sub>20</sub>, SCOR<sub>20</sub>, SO<sub>3</sub>R<sub>20</sub>, SO<sub>2</sub>NR<sub>18</sub>R<sub>19</sub>, PO(OR<sub>20</sub>)<sub>3</sub>, PO(OR<sub>20</sub>)<sub>2</sub>R<sub>20</sub>, NO<sub>2</sub>, CN, CNR<sub>20</sub>(NR<sub>18</sub>R<sub>19</sub>), CNR<sub>19</sub>(SR<sub>20</sub>), COOR<sub>20</sub>, COSR<sub>20</sub>, CONR<sub>18</sub>R<sub>19</sub>,

with the proviso that when a position adjacent to R<sub>15</sub> is substituted, then R<sub>15</sub> and said adjacent position can together be selected from SCH<sub>2</sub>S, SCH<sub>2</sub>CH<sub>2</sub>S, OCH<sub>2</sub>O, or OCH<sub>2</sub>CH<sub>2</sub>O to form a bi-cyclic structure;

R<sub>18</sub> and R<sub>19</sub> are each independently selected from H, C<sub>1-8</sub> straight chain or branched alkyl, C<sub>2-8</sub> alkenyl or cycloalkyl, or alkylcycloalkyl, or aryl, or CH<sub>2</sub>aryl, wherein each moiety within said C<sub>1-8</sub> straight chain or branched alkyl, C<sub>2-8</sub> alkenyl or cycloalkyl, or alkylcycloalkyl, or aryl or CH<sub>2</sub>aryl may be optionally substituted by up to four substituents in any position, whereby each substituent is independently selected from: F, Cl, Br, I, CF<sub>3</sub>, CCl<sub>3</sub>, CH<sub>3</sub>, C<sub>2</sub>H<sub>5</sub>, C<sub>3</sub>H<sub>7</sub>, C<sub>4</sub>H<sub>9</sub>, NH<sub>2</sub>, NHCH<sub>3</sub>, N(CH<sub>3</sub>)<sub>2</sub>, NHC<sub>2</sub>H<sub>5</sub>, N(C<sub>2</sub>H<sub>5</sub>)<sub>2</sub>, NHC<sub>3</sub>H<sub>7</sub>, N(C<sub>3</sub>H<sub>7</sub>)<sub>2</sub>, NHC<sub>4</sub>H<sub>9</sub>, N(C<sub>4</sub>H<sub>9</sub>)<sub>2</sub>, NHCOH, NHCOCH<sub>3</sub>, NHCOC<sub>2</sub>H<sub>5</sub>, NHCOC<sub>3</sub>H<sub>7</sub>, NHCOC<sub>4</sub>H<sub>9</sub>, NHSO<sub>2</sub>CH<sub>3</sub>, NHSO<sub>2</sub>C<sub>2</sub>H<sub>5</sub>, NHSO<sub>2</sub>C<sub>3</sub>H<sub>7</sub>, NHSO<sub>2</sub>C<sub>4</sub>H<sub>9</sub>, OH, OCH<sub>3</sub>, OC<sub>2</sub>H<sub>5</sub>, OC<sub>3</sub>H<sub>7</sub>, OC<sub>4</sub>H<sub>9</sub>, OC<sub>5</sub>H<sub>9</sub>, OC<sub>5</sub>H<sub>11</sub>, OC<sub>6</sub>H<sub>11</sub>, OC<sub>6</sub>H<sub>13</sub>, OCF<sub>3</sub>, OCOCH<sub>3</sub>, OCOC<sub>2</sub>H<sub>5</sub>, OCOC<sub>3</sub>H<sub>7</sub>, OCOC<sub>4</sub>H<sub>9</sub>, OSO<sub>2</sub>CH<sub>3</sub>, OSO<sub>2</sub>C<sub>2</sub>H<sub>5</sub>, OSO<sub>2</sub>C<sub>3</sub>H<sub>7</sub>, OSO<sub>2</sub>C<sub>4</sub>H<sub>9</sub>, SH, SCH<sub>3</sub>, SC<sub>2</sub>H<sub>5</sub>, SC<sub>3</sub>H<sub>7</sub>, SC<sub>4</sub>H<sub>9</sub>, SC<sub>5</sub>H<sub>9</sub>, SC<sub>5</sub>H<sub>11</sub>, SC<sub>6</sub>H<sub>11</sub>, SC<sub>6</sub>H<sub>13</sub>, SCF<sub>3</sub>, SCOCH<sub>3</sub>, SCOC<sub>2</sub>H<sub>5</sub>, SCOC<sub>3</sub>H<sub>7</sub>, SCOC<sub>4</sub>H<sub>9</sub>, SO<sub>3</sub>CH<sub>3</sub>, SO<sub>3</sub>C<sub>2</sub>H<sub>5</sub>, SO<sub>3</sub>C<sub>3</sub>H<sub>7</sub>, SO<sub>3</sub>C<sub>4</sub>H<sub>9</sub>, SO<sub>2</sub>NH, SO<sub>2</sub>NH<sub>2</sub>, SO<sub>2</sub>NHCH<sub>3</sub>, SO<sub>2</sub>N(CH<sub>3</sub>)<sub>2</sub>, SO<sub>2</sub>NHC<sub>2</sub>H<sub>5</sub>, SO<sub>2</sub>N(C<sub>2</sub>H<sub>5</sub>)<sub>2</sub>, SO<sub>2</sub>NHC<sub>3</sub>H<sub>7</sub>, SO<sub>2</sub>N(C<sub>3</sub>H<sub>7</sub>)<sub>2</sub>, SO<sub>2</sub>NHC<sub>4</sub>H<sub>9</sub>, SO<sub>2</sub>N(C<sub>4</sub>H<sub>9</sub>)<sub>2</sub>, NO<sub>2</sub>, CN, COOCH<sub>3</sub>, COOC<sub>2</sub>H<sub>5</sub>, COOC<sub>3</sub>H<sub>7</sub>, COOC<sub>4</sub>H<sub>9</sub>, COSCH<sub>3</sub>, COSC<sub>2</sub>H<sub>5</sub>, COSC<sub>3</sub>H<sub>7</sub>, COSC<sub>4</sub>H<sub>9</sub>, CONH<sub>2</sub>, CONHCH<sub>3</sub>, CON(CH<sub>3</sub>)<sub>2</sub>, CONHC<sub>2</sub>H<sub>5</sub>, CON(C<sub>2</sub>H<sub>5</sub>)<sub>2</sub>, CONHC<sub>3</sub>H<sub>7</sub>, CON(C<sub>3</sub>H<sub>7</sub>)<sub>2</sub>, CONHC<sub>4</sub>H<sub>9</sub>, CON(C<sub>4</sub>H<sub>9</sub>)<sub>2</sub>, and

with the proviso that when either or both of R<sub>18</sub> or R<sub>19</sub> contain an aryl ring substituted at at least two adjacent positions on said aryl ring, then said two adjacent positions can together be selected from SCH<sub>2</sub>S, SCH<sub>2</sub>CH<sub>2</sub>S, OCH<sub>2</sub>O, or OCH<sub>2</sub>CH<sub>2</sub>O to form a bi-cyclic structure;

R<sub>13</sub>, R<sub>14</sub>, R<sub>15</sub>, R<sub>16</sub> and R<sub>17</sub> each independently selected from the following: F, Cl, Br, I, CF<sub>3</sub>,  
 5 CCl<sub>3</sub>, CH<sub>3</sub>, C<sub>2</sub>H<sub>5</sub>, C<sub>3</sub>H<sub>7</sub>, C<sub>4</sub>H<sub>9</sub>, NH<sub>2</sub>, NHCH<sub>3</sub>, N(CH<sub>3</sub>)<sub>2</sub>, NHC<sub>2</sub>H<sub>5</sub>, N(C<sub>2</sub>H<sub>5</sub>)<sub>2</sub>, NHC<sub>3</sub>H<sub>7</sub>, N(C<sub>3</sub>H<sub>7</sub>)<sub>2</sub>,  
 NHC<sub>4</sub>H<sub>9</sub>, N(C<sub>4</sub>H<sub>9</sub>)<sub>2</sub>, NHCOH, NHCOCH<sub>3</sub>, NHCOC<sub>2</sub>H<sub>5</sub>, NHCOC<sub>3</sub>H<sub>7</sub>, NHCOC<sub>4</sub>H<sub>9</sub>, NHSO<sub>2</sub>CH<sub>3</sub>,  
 NHSO<sub>2</sub>C<sub>2</sub>H<sub>5</sub>, NHSO<sub>2</sub>C<sub>3</sub>H<sub>7</sub>, NHSO<sub>2</sub>C<sub>4</sub>H<sub>9</sub>, OH, OCH<sub>3</sub>, OC<sub>2</sub>H<sub>5</sub>, OC<sub>3</sub>H<sub>7</sub>, OC<sub>4</sub>H<sub>9</sub>, OC<sub>5</sub>H<sub>9</sub>,  
 OC<sub>5</sub>H<sub>11</sub>, OC<sub>6</sub>H<sub>11</sub>, OC<sub>6</sub>H<sub>13</sub>, OCF<sub>3</sub>, OCOCH<sub>3</sub>, OCOC<sub>2</sub>H<sub>5</sub>, OCOC<sub>3</sub>H<sub>7</sub>, OCOC<sub>4</sub>H<sub>9</sub>, OSO<sub>2</sub>CH<sub>3</sub>, OSO<sub>2</sub>C<sub>2</sub>H<sub>5</sub>,  
 OSO<sub>2</sub>C<sub>3</sub>H<sub>7</sub>, OSO<sub>2</sub>C<sub>4</sub>H<sub>9</sub>, SH, SCH<sub>3</sub>, SC<sub>2</sub>H<sub>5</sub>, SC<sub>3</sub>H<sub>7</sub>, SC<sub>4</sub>H<sub>9</sub>, SC<sub>5</sub>H<sub>9</sub>, SC<sub>5</sub>H<sub>11</sub>, SC<sub>6</sub>H<sub>11</sub>, SC<sub>6</sub>H<sub>13</sub>,  
 10 SCF<sub>3</sub>, SCOCH<sub>3</sub>, SCOC<sub>2</sub>H<sub>5</sub>, SCOC<sub>3</sub>H<sub>7</sub>, SCOC<sub>4</sub>H<sub>9</sub>, SO<sub>3</sub>CH<sub>3</sub>, SO<sub>3</sub>C<sub>2</sub>H<sub>5</sub>, SO<sub>3</sub>C<sub>3</sub>H<sub>7</sub>, SO<sub>3</sub>C<sub>4</sub>H<sub>9</sub>, SO<sub>2</sub>NH,  
 SO<sub>2</sub>NH<sub>2</sub>, SO<sub>2</sub>NHCH<sub>3</sub>, SO<sub>2</sub>N(CH<sub>3</sub>)<sub>2</sub>, SO<sub>2</sub>NHC<sub>2</sub>H<sub>5</sub>, SO<sub>2</sub>N(C<sub>2</sub>H<sub>5</sub>)<sub>2</sub>, SO<sub>2</sub>NHC<sub>3</sub>H<sub>7</sub>, SO<sub>2</sub>N(C<sub>3</sub>H<sub>7</sub>)<sub>2</sub>,  
 SO<sub>2</sub>NHC<sub>4</sub>H<sub>9</sub>, SO<sub>2</sub>N(C<sub>4</sub>H<sub>9</sub>)<sub>2</sub>, NO<sub>2</sub>, CN, COOCH<sub>3</sub>, COOC<sub>2</sub>H<sub>5</sub>, COOC<sub>3</sub>H<sub>7</sub>, COOC<sub>4</sub>H<sub>9</sub>, COSCH<sub>3</sub>,  
 COSC<sub>2</sub>H<sub>5</sub>, COSC<sub>3</sub>H<sub>7</sub>, COSC<sub>4</sub>H<sub>9</sub>, CONH<sub>2</sub>, CONHCH<sub>3</sub>, CON(CH<sub>3</sub>)<sub>2</sub>, CONHC<sub>2</sub>H<sub>5</sub>, CON(C<sub>2</sub>H<sub>5</sub>)<sub>2</sub>,  
 CONHC<sub>3</sub>H<sub>7</sub>, CON(C<sub>3</sub>H<sub>7</sub>)<sub>2</sub>, CONHC<sub>4</sub>H<sub>9</sub>, CON(C<sub>4</sub>H<sub>9</sub>)<sub>2</sub>, and

15 with the proviso that when any two adjacent positions of R<sub>13</sub>, R<sub>14</sub>, R<sub>15</sub>, R<sub>16</sub> and R<sub>17</sub> are substituted, said two adjacent positions can together be further selected from SCH<sub>2</sub>S, SCH<sub>2</sub>CH<sub>2</sub>S, OCH<sub>2</sub>O, or OCH<sub>2</sub>CH<sub>2</sub>O to form a bi-cyclic structure; and

with the proviso that at least one of R<sub>13</sub>, R<sub>14</sub>, R<sub>15</sub>, R<sub>16</sub> and R<sub>17</sub> must be H.

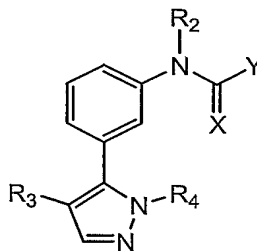
[0242] An aryl moiety can be a 5 or 6 membered aromatic heterocyclic ring (containing up to  
 20 4 hetero atoms independently selected from N, O, or S) or a 6 membered aromatic non-heterocyclic ring or a polycycle.

[0243] In some embodiments of the foregoing genus, compounds of Example 13, Experiments 1-43, *infra*, and combinations or subcombinations thereof, are included.

[0244] In some embodiments of the foregoing genus, compounds of Example 13, Experiments 1-43, *infra*, and combinations or subcombinations thereof, are not included.

[0245] The present invention further provides methods for modulating the activity of a human 5-HT<sub>2A</sub> serotonin receptor by contacting the receptor with a compound of formula:

-88-



(B)

wherein:

R<sub>2</sub> is H or lower alkyl (C<sub>1-4</sub>);

R<sub>3</sub> is Me, or Et, or halogen;

5 X is either Oxygen or Sulfur;

Y is NR<sub>15</sub>R<sub>16</sub>, or (CH<sub>2</sub>)<sub>m</sub>R<sub>17</sub>, or O(CH<sub>2</sub>)<sub>n</sub>R<sub>17</sub>;

R<sub>4</sub> is lower alkyl (C<sub>1-6</sub>);

m=0-4

n=0-4

10 R<sub>15</sub> is H or lower alkyl(C<sub>1-4</sub>);

R<sub>16</sub> and R<sub>17</sub> are independently C<sub>1-6</sub> alkyl, or C<sub>2-6</sub> alkenyl, or cycloalkyl, or aryl group and each said group may be optionally substituted by up to four substituents in any position independently selected from CF<sub>3</sub>, CCl<sub>3</sub>, Me, NO<sub>2</sub>, OH, OMe, OEt, CONR<sub>18</sub>R<sub>19</sub>, NR<sub>18</sub>R<sub>19</sub>, NHCOCH<sub>3</sub>, OCF<sub>3</sub>, SMe, COOR<sub>20</sub>, SO<sub>3</sub>R<sub>20</sub>, SO<sub>2</sub>NR<sub>18</sub>R<sub>19</sub>, COMe, COEt, CO-lower alkyl, SCF<sub>3</sub>, CN, C<sub>2-6</sub> alkenyl, H, halogens, C<sub>1-4</sub> alkoxy, C<sub>3-6</sub> cycloalkyl, C<sub>1-6</sub> alkyl, aryl and aryloxy wherein each of the C<sub>1-4</sub> alkoxy, C<sub>3-6</sub> cycloalkyl, C<sub>1-6</sub> alkyl, aryl and aryloxy groups may be further optionally substituted by up to four substituents in any position independently selected from CF<sub>3</sub>, CCl<sub>3</sub>, Me, NO<sub>2</sub>, OH, OMe, OEt, CONR<sub>21</sub>R<sub>22</sub>, NR<sub>21</sub>R<sub>22</sub>, NHCOCH<sub>3</sub>, OCF<sub>3</sub>, SMe, COOR<sub>23</sub>, SO<sub>3</sub>R<sub>23</sub>, SO<sub>2</sub>NR<sub>21</sub>R<sub>22</sub>, COMe, COEt, CO-lower alkyl, SCF<sub>3</sub>, CN, C<sub>2-6</sub> alkenyl, H, halogens, C<sub>1-4</sub> alkoxy, C<sub>3-6</sub> cycloalkyl, C<sub>1-6</sub> alkyl, and aryl;

20 R<sub>18</sub> and R<sub>19</sub> are independently a H or C<sub>1-6</sub> alkyl, or C<sub>2-6</sub> alkenyl, or cycloalkyl, or aryl, or CH<sub>2</sub> aryl group and each said group may be optionally substituted by up to four substituents in any position independently selected from CF<sub>3</sub>, CCl<sub>3</sub>, Me, NO<sub>2</sub>, OH, OMe, OEt, CONR<sub>21</sub>R<sub>22</sub>, NR<sub>21</sub>R<sub>22</sub>, NHCOCH<sub>3</sub>, OCF<sub>3</sub>, SMe, COOR<sub>23</sub>, SO<sub>3</sub>R<sub>23</sub>, SO<sub>2</sub>NR<sub>21</sub>R<sub>22</sub>, COMe, COEt, CO-lower alkyl, SCF<sub>3</sub>, CN, C<sub>2-6</sub> alkenyl, H, halogens, C<sub>1-4</sub> alkoxy, C<sub>3-6</sub> cycloalkyl, C<sub>1-6</sub> alkyl, and aryl

25 or R<sub>18</sub> and R<sub>19</sub> may form part of a 5, 6 or 7 membered cyclic structure which may be either saturated or unsaturated and that may contain up to four heteroatoms selected from O, N or S and said cyclic structure may be optionally substituted by up

-89-

to four substituents in any position independently selected from CF<sub>3</sub>, CCl<sub>3</sub>, Me, NO<sub>2</sub>, OH, OMe, OEt, OCF<sub>3</sub>, SMe, COOR<sub>7</sub>, SO<sub>2</sub>NR<sub>24</sub>R<sub>25</sub>, SO<sub>3</sub>R<sub>26</sub>, NHCOCH<sub>3</sub>, COEt, COMe, or halogen;

R<sub>20</sub> and R<sub>23</sub> are each independently selected from H or C<sub>1-6</sub> alkyl;

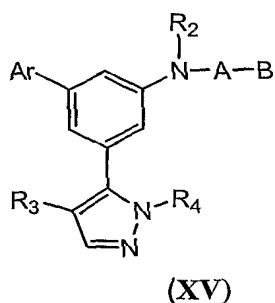
- 5           R<sub>21</sub> and R<sub>22</sub> are each independently are independently a H, or C<sub>1-6</sub> alkyl, or C<sub>2-6</sub> alkenyl, or cycloalkyl, or aryl, or CH<sub>2</sub> aryl group and each said group may be optionally substituted by up to four substituents in any position independently selected from halogen, CF<sub>3</sub>, OCF<sub>3</sub>, OEt, CCl<sub>3</sub>, Me, NO<sub>2</sub>, OH, OMe, SMe, COMe, CN, COOR<sub>20</sub>, SO<sub>3</sub>R<sub>20</sub>, COEt, NHCOCH<sub>3</sub>, or aryl.

- 10   [0246]       An aryl moiety can be a 5 or 6 membered aromatic hetero-cyclic ring (containing up to 4 hetero atoms independently selected from N, O, or S) or a 6 membered aromatic non-heterocyclic ring or a polycycle.

[0247]       In some embodiments of the foregoing genus, compounds of Example 13, Experiments 1-43, *infra*, and combinations or subcombinations thereof, are included.

- 15   [0248]       In some embodiments of the foregoing genus, compounds of Example 13, Experiments 1-43, *infra*, and combinations or subcombinations thereof, are not included.

[0249]       The present invention further provides methods for modulating the activity of a human 5-HT<sub>2A</sub> serotonin receptor by contacting the receptor with a compound of formula:



- 20   wherein:

- ii)       Ar is a phenyl ring optionally substituted with up to five groups selected from the group consisting of halogen, OR<sub>7</sub>, OH, NR<sub>8</sub>R<sub>9</sub>, carboxy, CN, alkoxycarbonyl, straight chain or branched C<sub>1-6</sub> alkyl -C(p)<sub>3</sub>, or -O-C(p)<sub>3</sub> where p is halogen;

- 25           R<sub>8</sub> and R<sub>9</sub> are independently a H, or C<sub>1-6</sub> alkyl, or C<sub>2-6</sub> alkenyl, or cycloalkyl, or aryl, or CH<sub>2</sub> aryl group and each said group may be optionally substituted by up to four substituents in any position independently selected from halogen, CF<sub>3</sub>, OCF<sub>3</sub>,

-90-

OEt, CCl<sub>3</sub>, Me, NO<sub>2</sub>, OH, OMe, SMe, COMe, CN, COOR<sub>10</sub>, SO<sub>3</sub>R<sub>10</sub>, COEt, NHCOCH<sub>3</sub>, or aryl; or

R<sub>8</sub> and R<sub>9</sub> may form part of a 5, 6 or 7 membered cyclic structure which may be either saturated or unsaturated and that may contain up to four heteroatoms selected from O, N or S and said cyclic structure may be optionally substituted by up to four substituents in any position independently selected from CF<sub>3</sub>, CCl<sub>3</sub>, Me, NO<sub>2</sub>, OH, OMe, OEt, OCF<sub>3</sub>, SMe, COOR<sub>10</sub>, SO<sub>2</sub>NR<sub>8</sub>R<sub>9</sub>, SO<sub>3</sub>R<sub>10</sub>, NHCOCH<sub>3</sub>, COEt, COMe, or halogen;

R<sub>7</sub> is H or C<sub>1-6</sub> alkyl;

R<sub>10</sub> is H or C<sub>1-6</sub> alkyl;

ii) R<sub>2</sub> is H, straight chain or branched C<sub>1-6</sub> alkyl, C<sub>2-6</sub> alkenyl, or cycloalkyl;

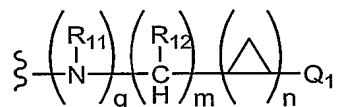
iv) R<sub>3</sub> is halogen, carboxy, CN, alkoxy carbonyl, straight chain or branched C<sub>1-6</sub> alkyl, C<sub>2-6</sub> alkenyl, C<sub>2-6</sub> alkynyl, cycloalkyl, aryl or heteroaryl, wherein each of said alkoxy carbonyl, straight chain or branched C<sub>1-6</sub> alkyl, C<sub>2-6</sub> alkenyl, C<sub>2-6</sub> alkynyl, cycloalkyl, aryl or heteroaryl groups can be optionally substituted with up to four substituents in any position selected from OH, OR<sub>10</sub>, NR<sub>8</sub>R<sub>9</sub>, halogen, -C(p)<sub>3</sub>, or -O-C(p)<sub>3</sub> where p is halogen, and said cycloalkyl, aryl or heteroaryl groups can alternatively or additionally be optionally substituted with up to four alkyl substituents in any position;

iv) R<sub>4</sub> is C<sub>1-6</sub> alkyl, C<sub>2-6</sub> alkenyl, or cycloalkyl;

v) A is C(=O), C(=S) or SO<sub>2</sub>;

vi) B is L<sub>1</sub> or L<sub>2</sub>;

L<sub>1</sub> is:



q is 0 or 1;

m is 0 or 1;

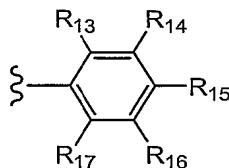
n is 0 or 1;

R<sub>11</sub> and R<sub>12</sub> are each independently H, straight chain or branched C<sub>1-6</sub> alkyl, C<sub>2-6</sub> alkenyl, or cycloalkyl;

Q<sub>1</sub> is:



-91-



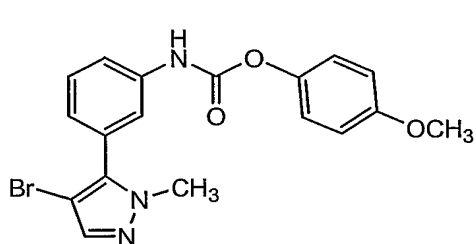
wherein:

$R_{13}$ ,  $R_{14}$ ,  $R_{15}$ ,  $R_{16}$  and  $R_{17}$  are each independently H, halogen, CN,  $NR_8R_9$ ,  $COOR_{10}$ ,  $SR_{10}$ , straight chain or branched  $C_{1-6}$  alkyl,  $C_{2-6}$  alkenyl,  $C_{2-6}$  alkynyl, cycloalkyl, aryl, alkylaryl, arylalkyl or heteroaryl, wherein each of said alkoxy carbonyl, straight chain or branched  $C_{1-6}$  alkyl,  $C_{2-6}$  alkenyl,  $C_{2-6}$  alkynyl, cycloalkyl, aryl, alkylaryl, arylalkyl or heteroaryl groups can be optionally substituted with up to four substituents in any position selected from  $NO_2$ ,  $OR_{10}$ ,  $NR_8R_9$ , halogen,  $-C(p)_3$ , or  $-O-C(p)_3$  where p is halogen, and said cycloalkyl, aryl, alkylaryl, arylalkyl or heteroaryl groups can alternatively or additionally be optionally substituted with up to four alkyl substituents in any position;

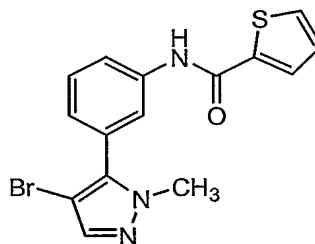
$L_2$  is  $-O-Q_2$  wherein  $Q_2$  is straight chain or branched  $C_{1-6}$  alkyl,

$C_{2-6}$  alkenyl,  $C_{2-6}$  alkynyl, cycloalkyl, aryl, alkylaryl, arylalkyl, wherein each of said cycloalkyl, aryl, alkylaryl, or arylalkyl groups can be optionally substituted with up to four substituents in any position selected from  $NO_2$ ,  $OR_7$ , halogen,  $-C(p)_3$ , or  $-O-C(p)_3$  where p is halogen, or an aliphatic or aromatic heterocycle, and said cycloalkyl, aryl, alkylaryl, and arylalkyl groups can alternatively or additionally be optionally substituted with up to four alkyl substituents in any position; or a pharmaceutically acceptable salt.

[0250] In some embodiments of the foregoing methods, the compounds are selected from compounds and combinations and subcombinations of compounds selected from the group consisting of:

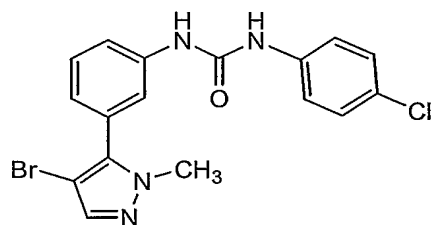


Compound 1

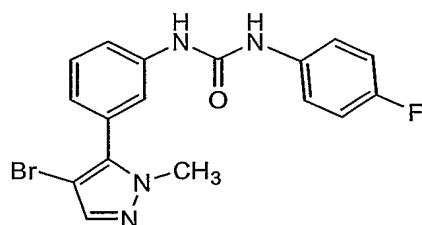


Compound 2

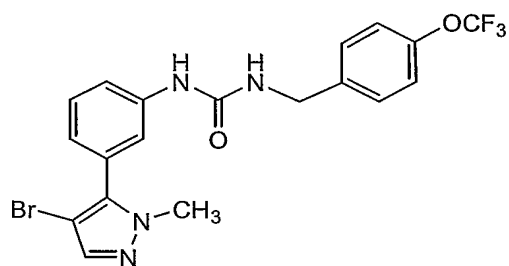
-92-



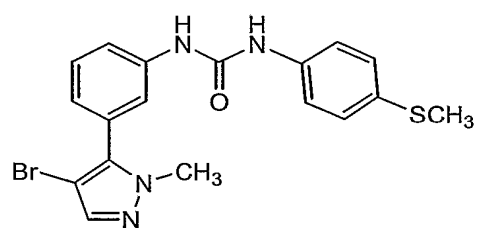
Compound 8



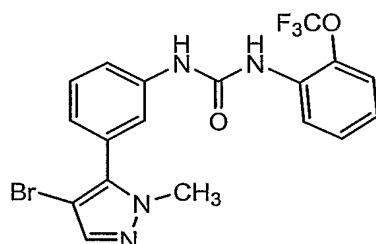
Compound 9



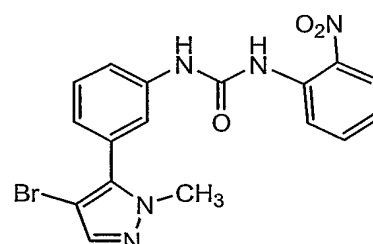
Compound 10



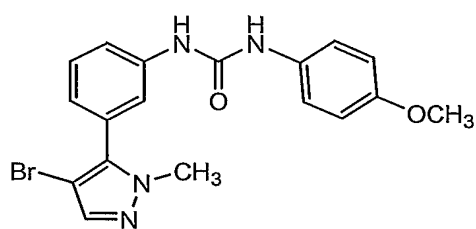
Compound 11



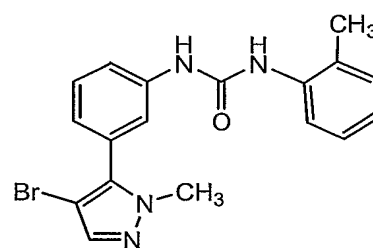
Compound 12



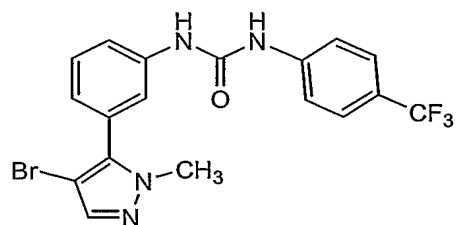
Compound 13



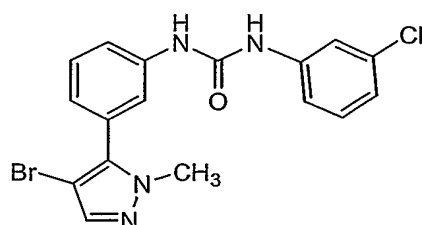
Compound 14



Compound 15



Compound 16

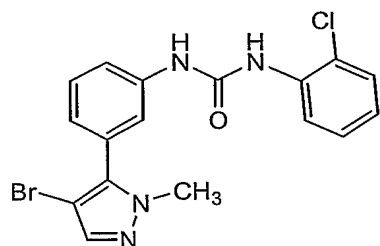


Compound 17

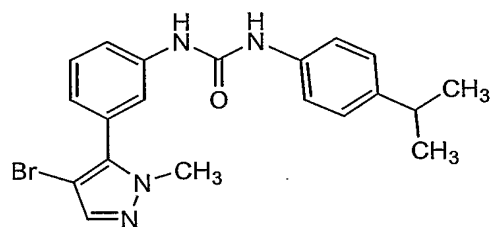
5

10

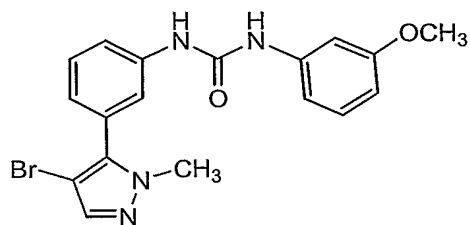
-93-



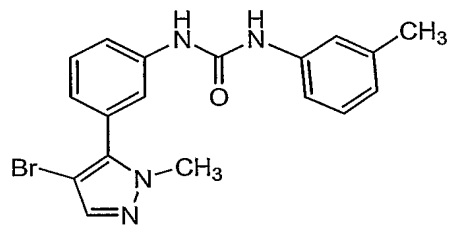
Compound 18



Compound 19

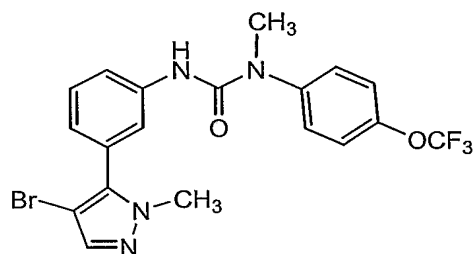


Compound 20

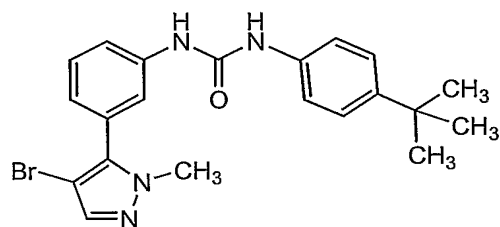


Compound 21

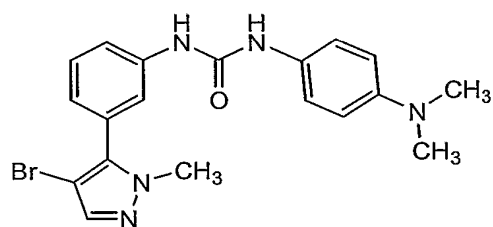
5



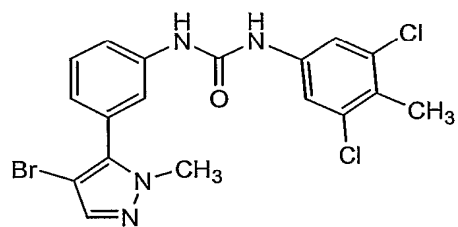
Compound 22



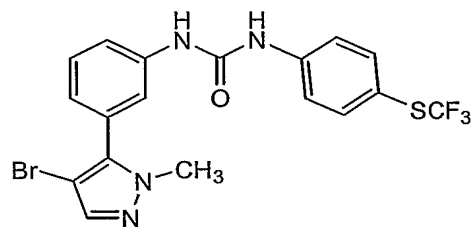
Compound 23



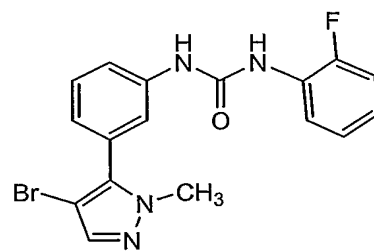
Compound 24



Compound 25



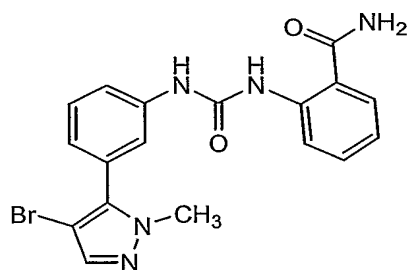
Compound 26



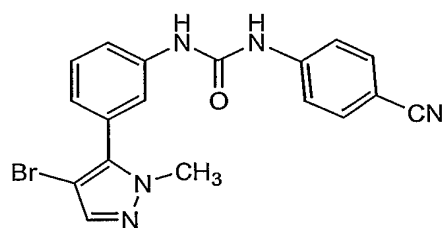
Compound 27

10

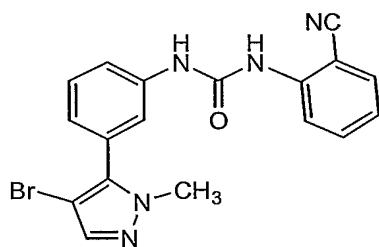
-94-



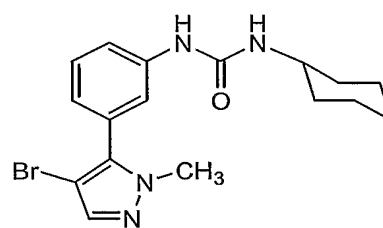
Compound 28



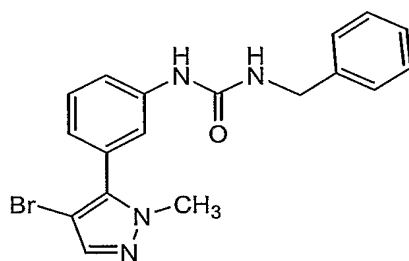
Compound 29



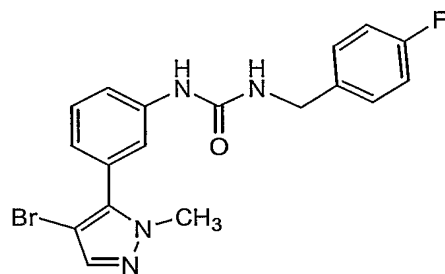
Compound 30



Compound 31

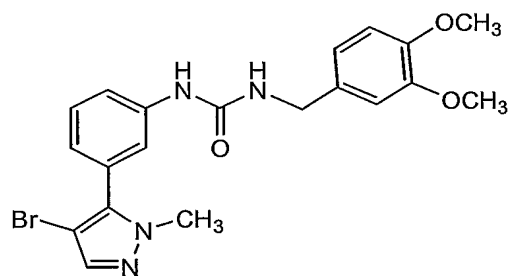


Compound 32

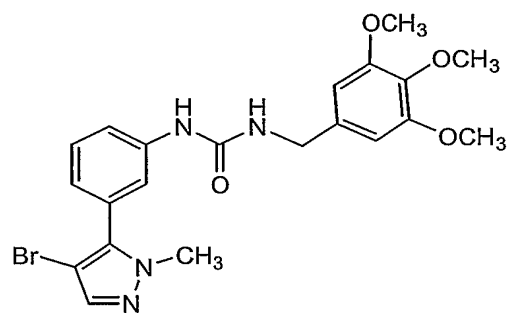


Compound 33

5

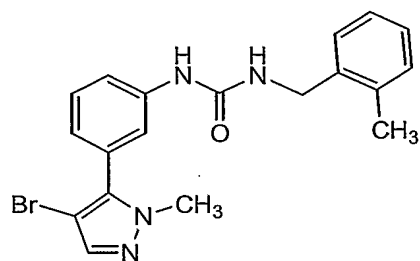


Compound 34

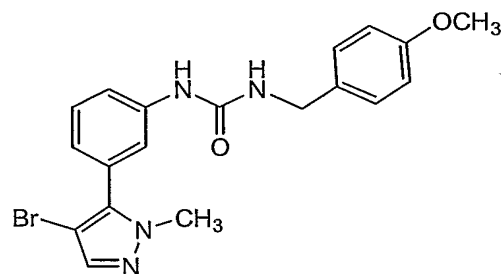


Compound 35

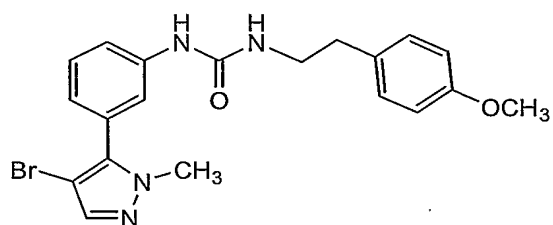
-95-



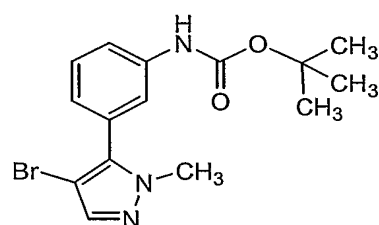
Compound 36



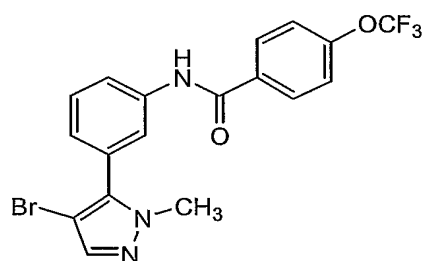
Compound 37



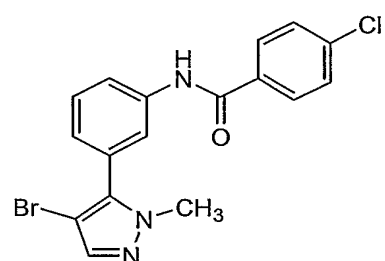
Compound 38



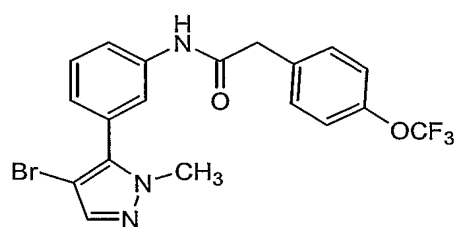
Compound 39



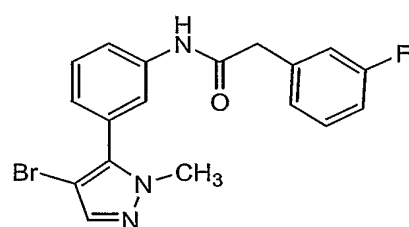
Compound 40



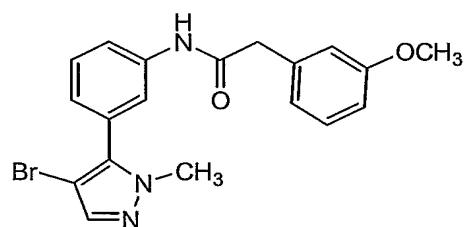
Compound 41



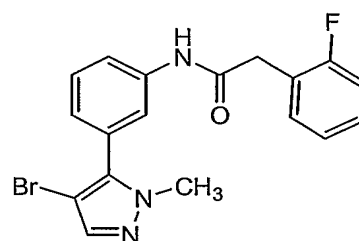
Compound 42



Compound 43

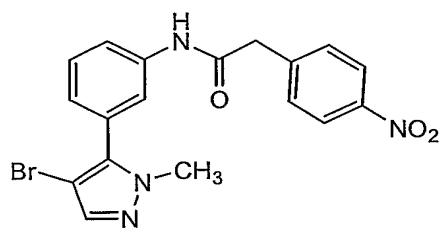


Compound 44

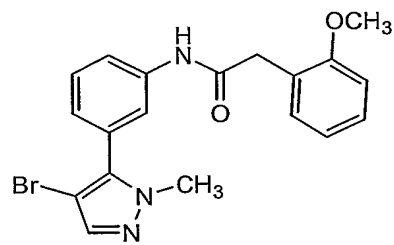


Compound 45

-96-



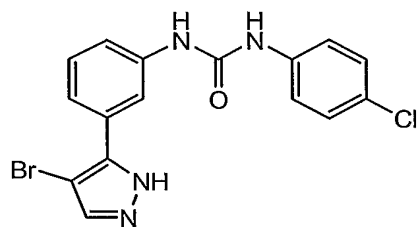
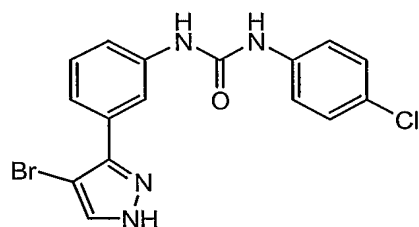
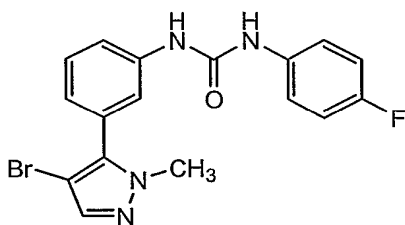
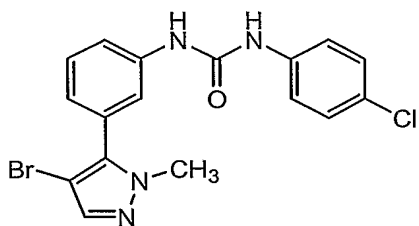
Compound 46



Compound 47

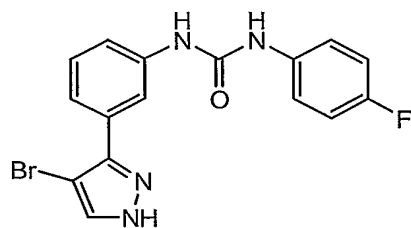
[0251] In some embodiments, the present invention provides the foregoing compounds, and combinations and subcombinations thereof.

5 [0252] In some preferred embodiments, the present invention provides compounds useful as inverse agonists for 5-HT<sub>2A</sub> receptors structurally represented as follows:

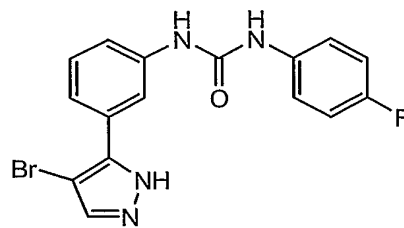


10

-97-

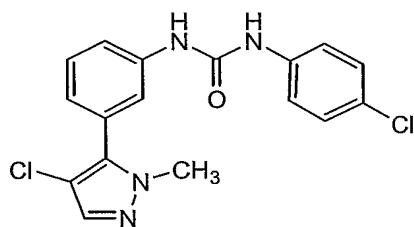


and

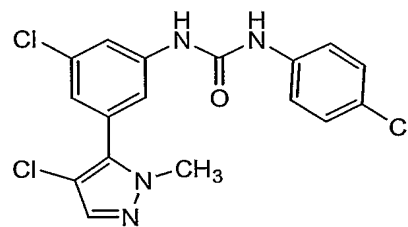


[0253] Also provided by the present invention are compositions comprising each of the compounds of the invention.

- 5 [0254] Other preferred compounds provided by the present invention and useful in the methods disclosed herein, include, but are not limited to:

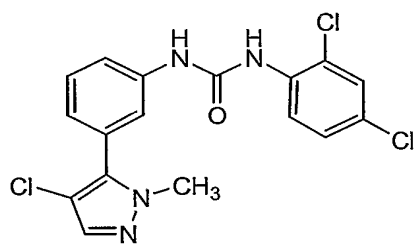


Compound 48

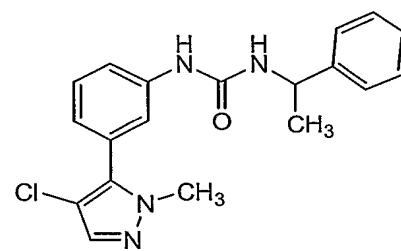


Compound 49

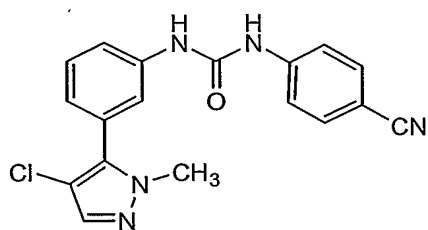
10



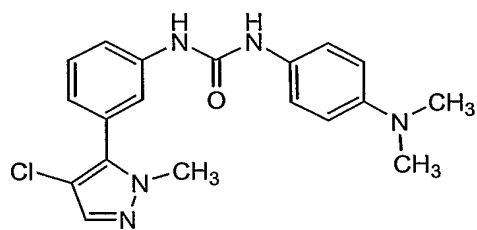
Compound 50



Compound 51



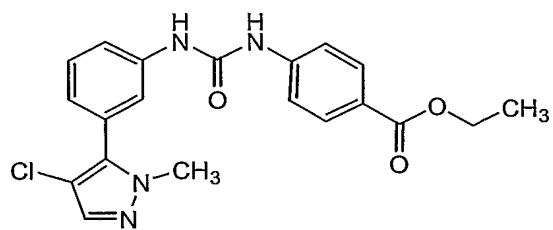
Compound 52



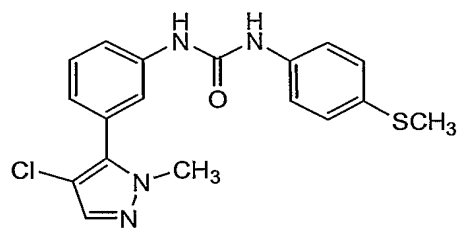
Compound 53

15

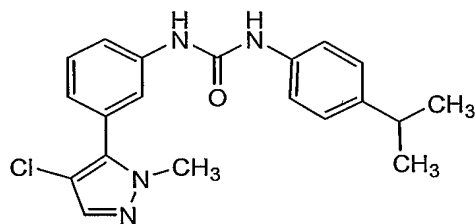
-98-



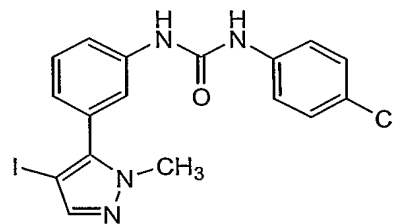
Compound 54



Compound 55

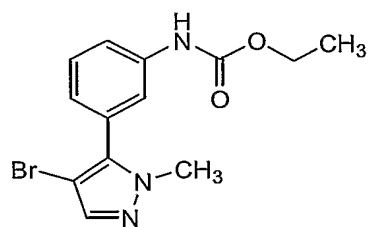


Compound 56

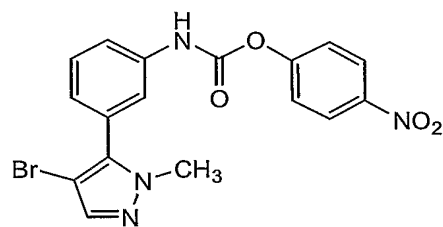


Compound 57

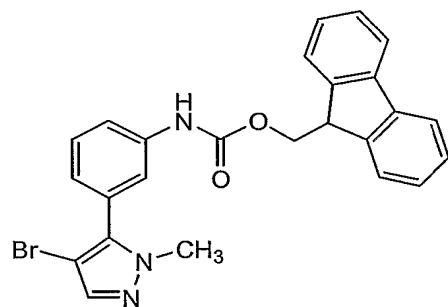
5



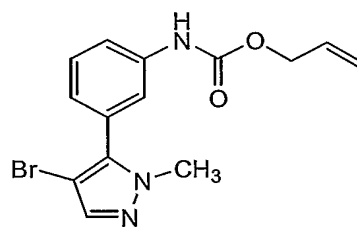
Compound 58



Compound 59



Compound 60

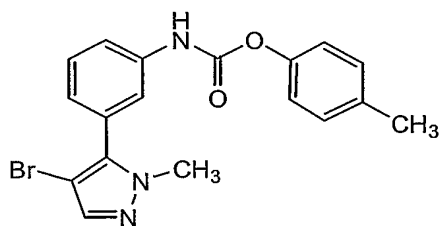


Compound 61

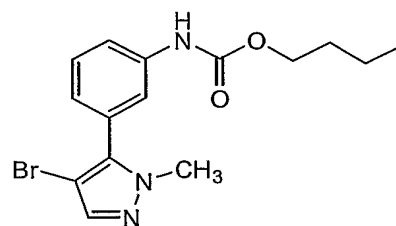
10



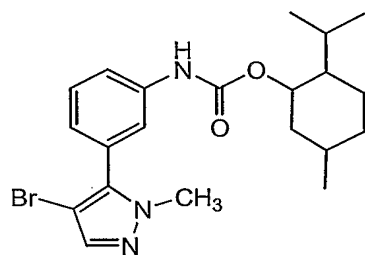
-99-



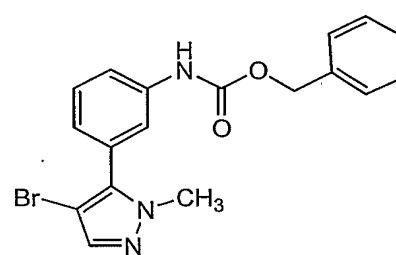
Compound 62



Compound 63

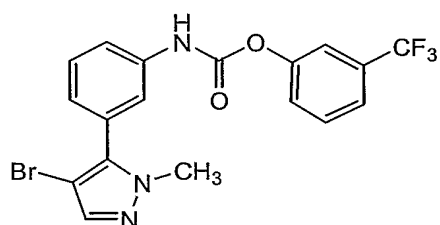


Compound 64

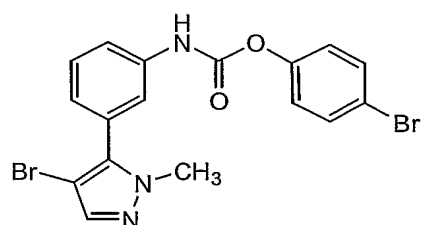


Compound 65

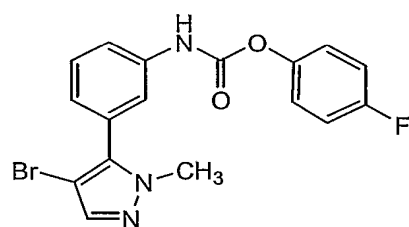
5



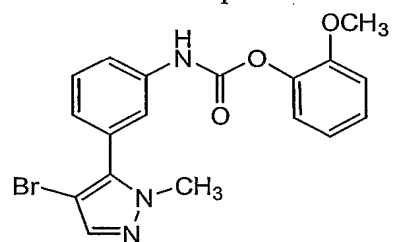
Compound 66



Compound 67

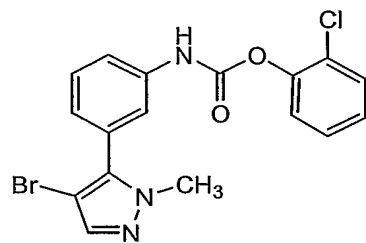


Compound 68

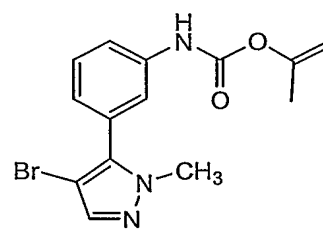


Compound 69

10

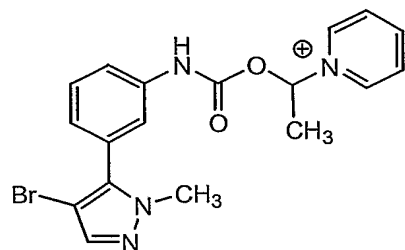


Compound 70

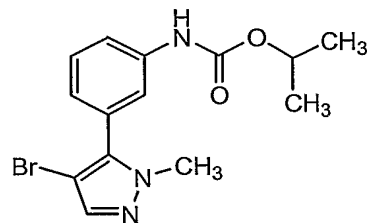


Compound 71

-100-

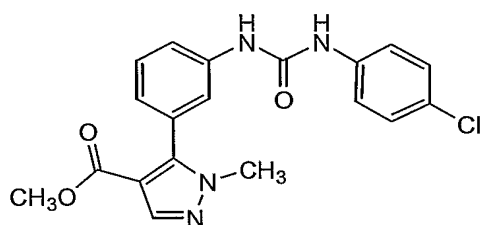


Compound 72

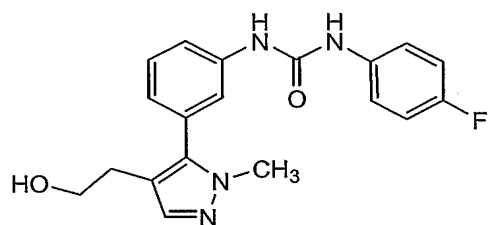


Compound 73

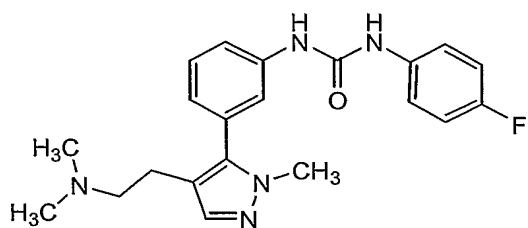
5



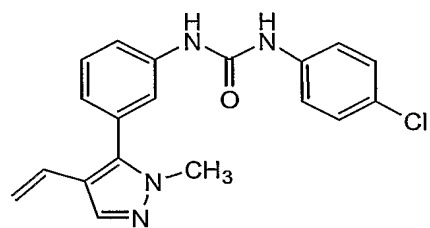
Compound 74



Compound 75

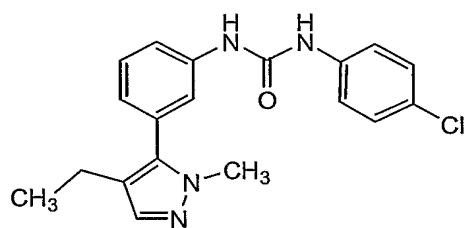


Compound 76

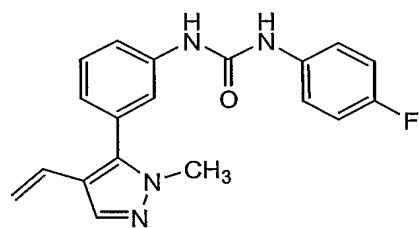


Compound 77

10



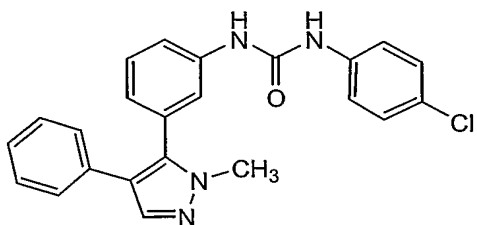
Compound 78



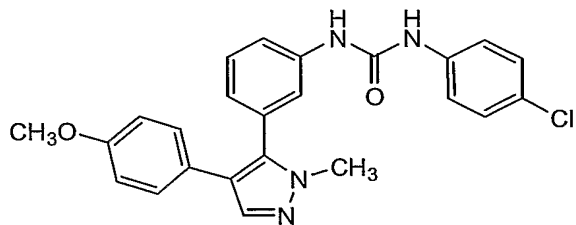
Compound 79

15

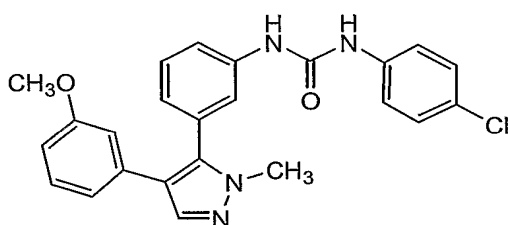
-101-



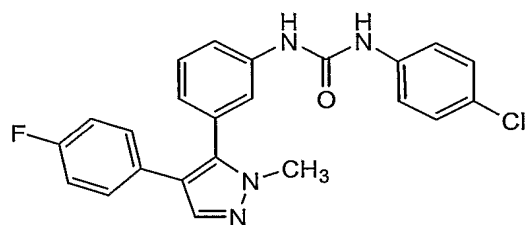
Compound 80



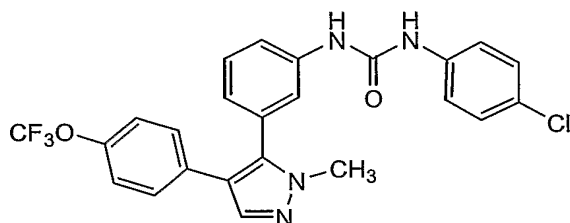
Compound 81



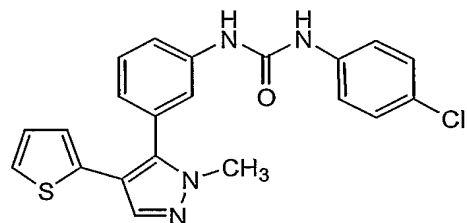
Compound 82



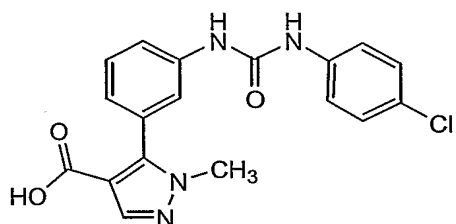
Compound 83



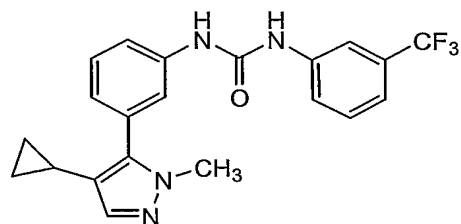
Compound 84



Compound 85



Compound 86

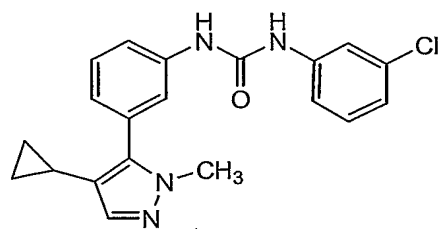


Compound 87

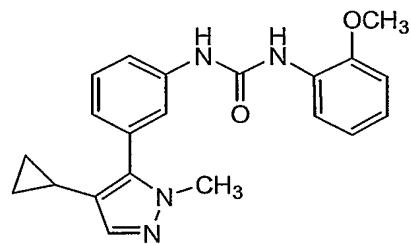
5

10

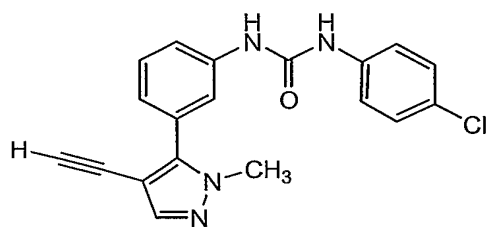
-102-



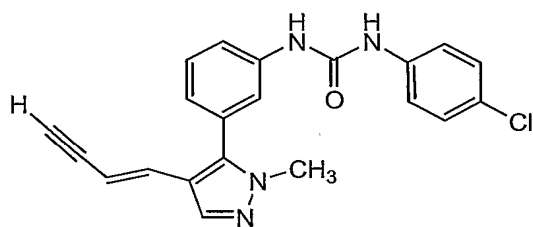
Compound 88



Compound 89

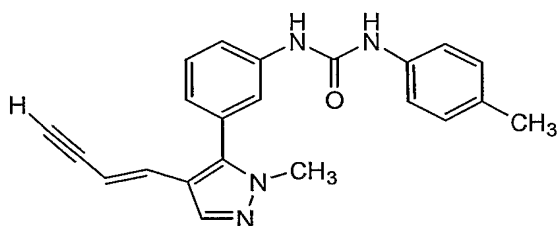


Compound 90

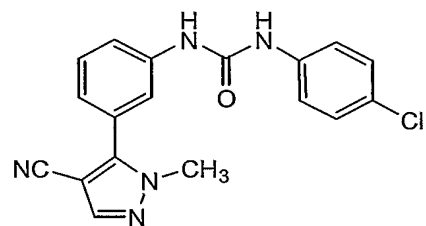


Compound 91

5

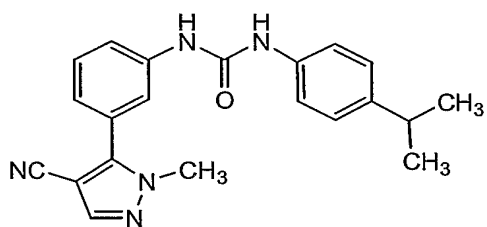


Compound 92

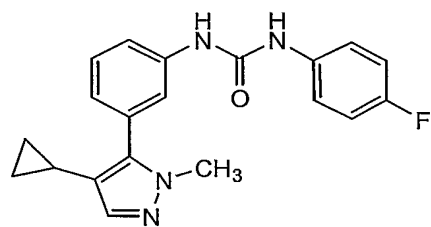


Compound 93

10

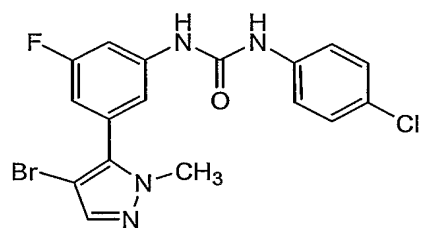


Compound 94

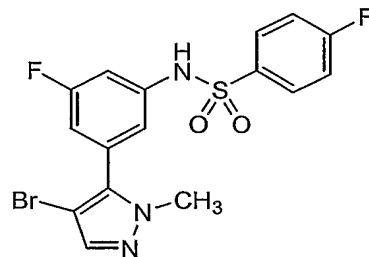


Compound 95

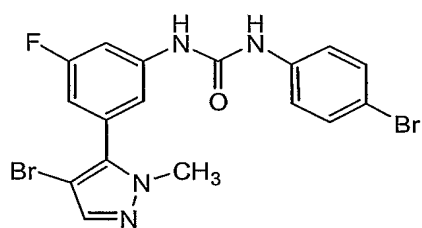
-103-



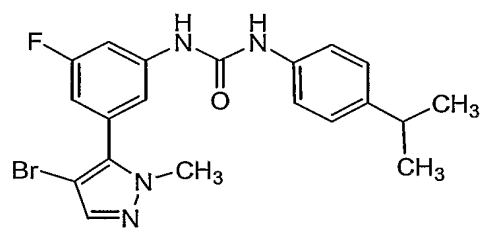
Compound 96



Compound 97

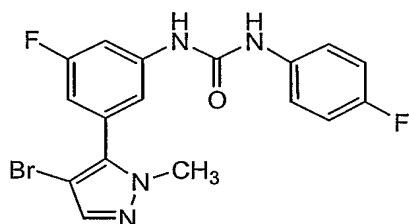


Compound 98

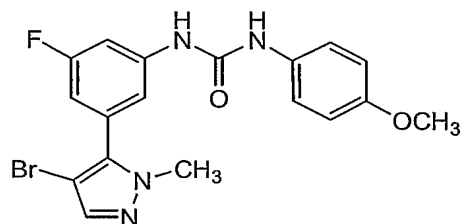


Compound 99

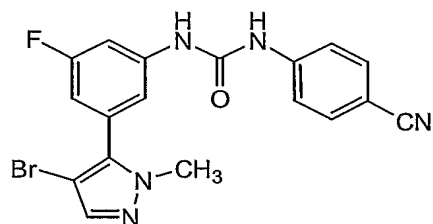
5



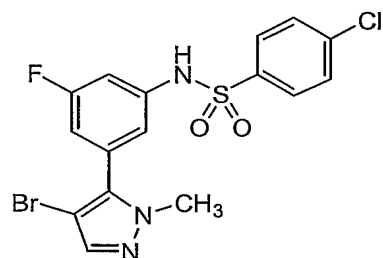
Compound 100



Compound 101



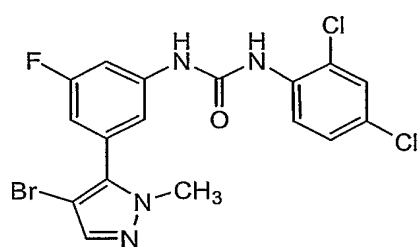
Compound 102



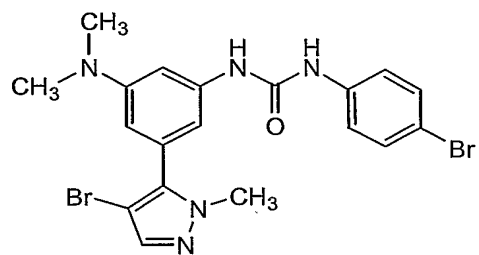
Compound 103

10

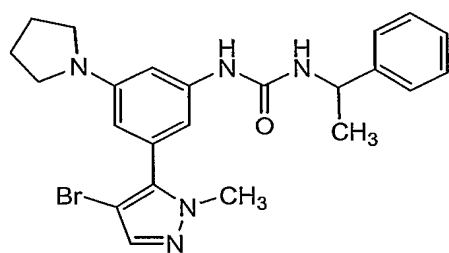
-104-



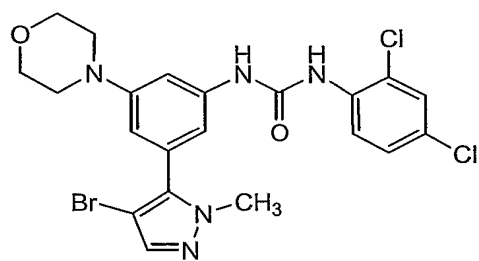
Compound 104



Compound 105

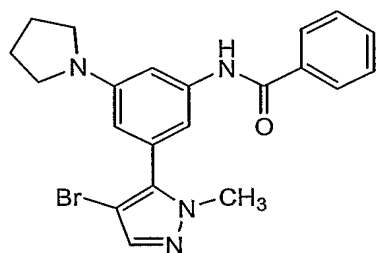


Compound 106

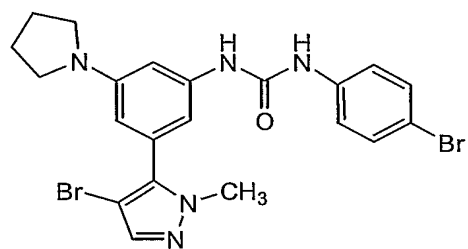


Compound 107

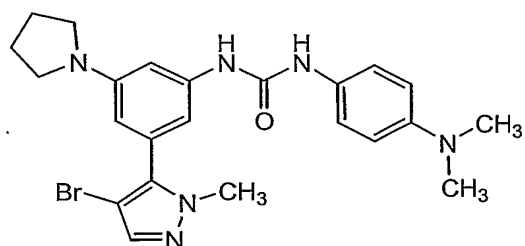
5



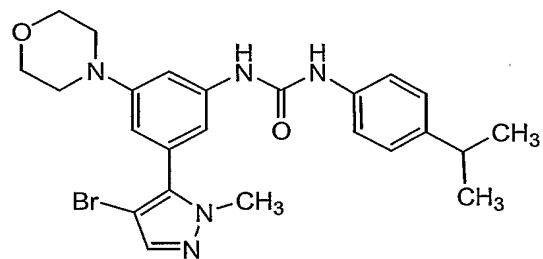
Compound 108



Compound 109



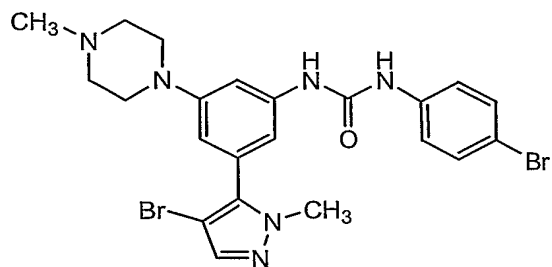
Compound 110



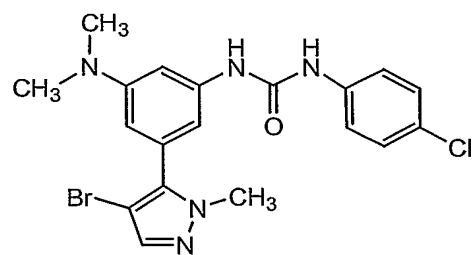
Compound 111

10

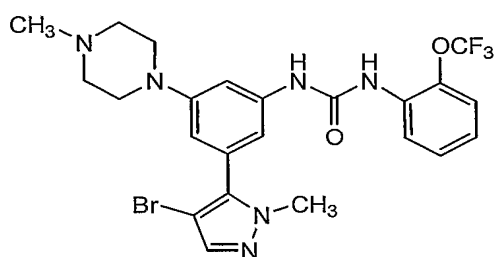
-105-



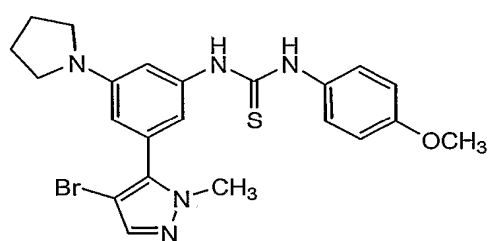
### Compound 112



### Compound 113

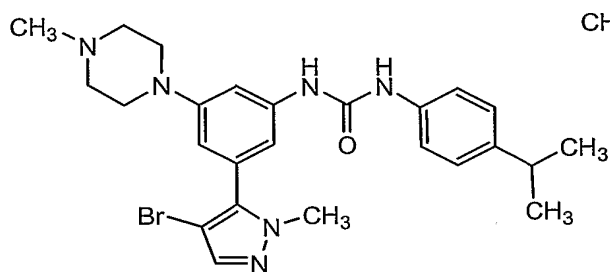


### Compound 114

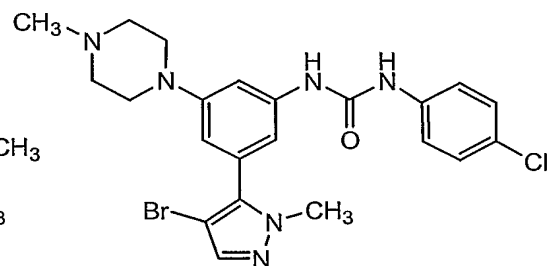


### Compound 115

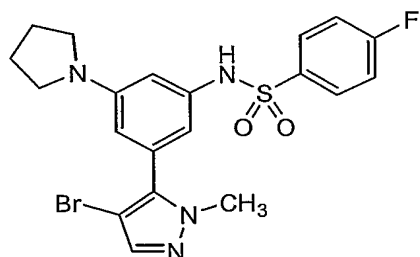
5



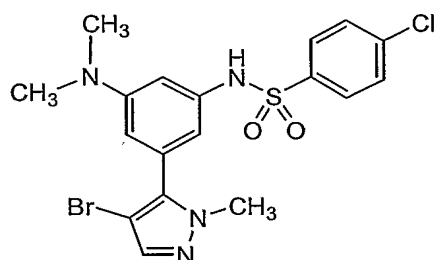
### Compound 116



### Compound 117



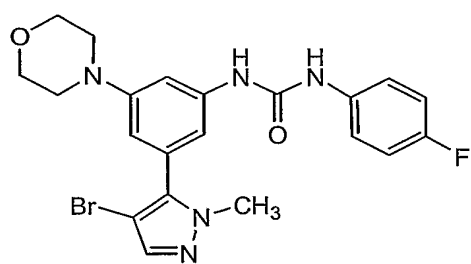
### Compound 118



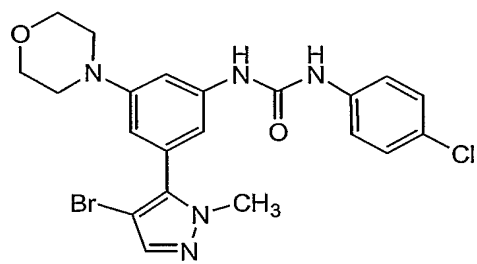
### Compound 119

10

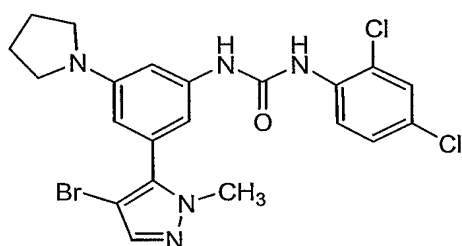
-106-



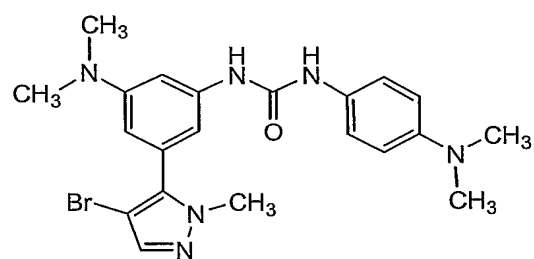
### Compound 120



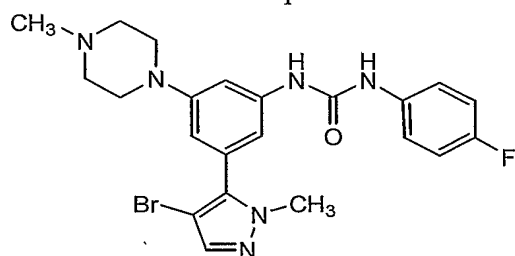
### Compound 121



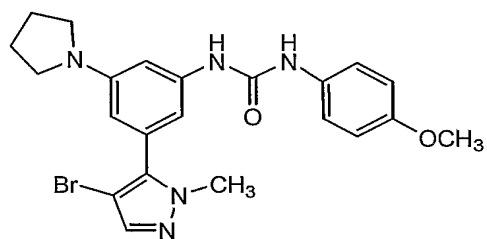
### Compound 122



Compound 123

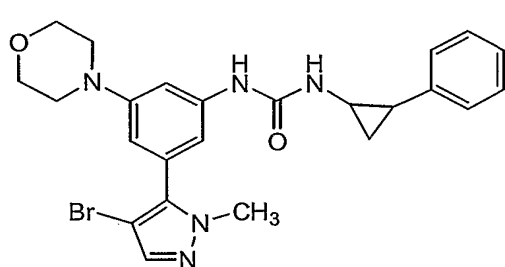


### Compound 124

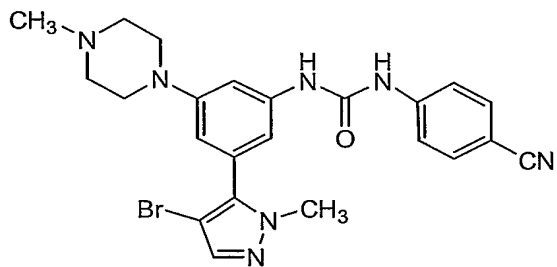


### Compound 125

5



Compound **126**

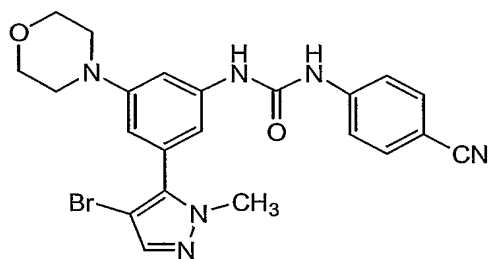


### Compound 127

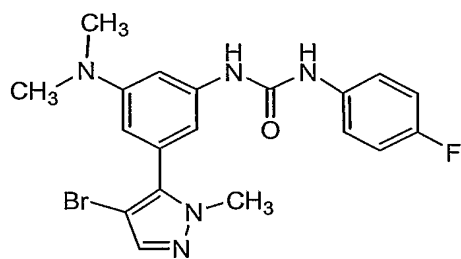
10



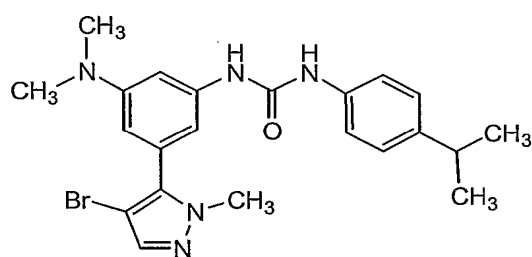
-107-



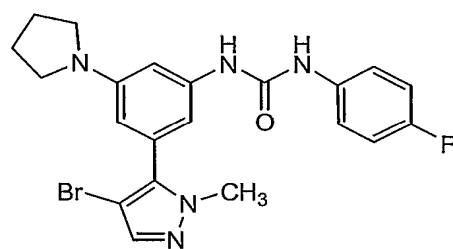
Compound 128



Compound 129

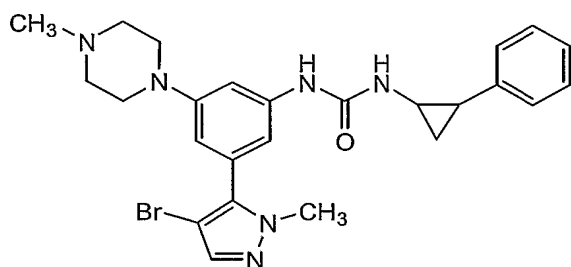


Compound 130

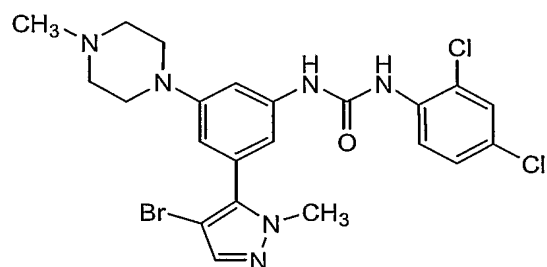


Compound 131

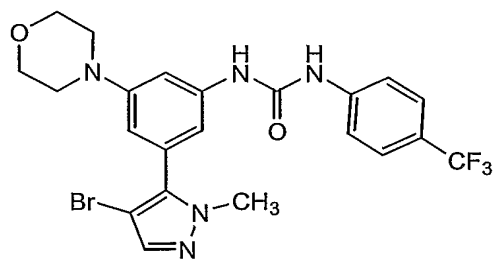
5



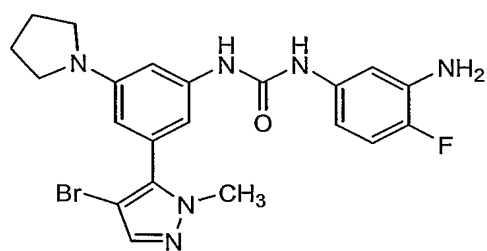
Compound 132



Compound 133



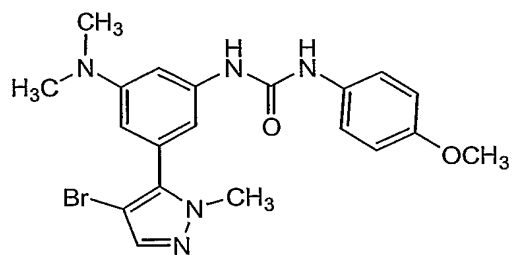
Compound 134



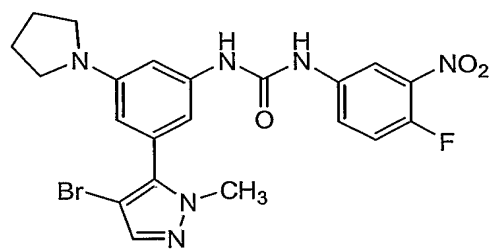
Compound 135

10

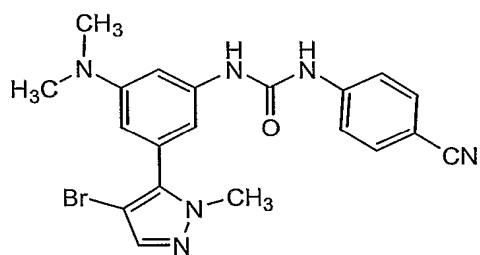
-108-



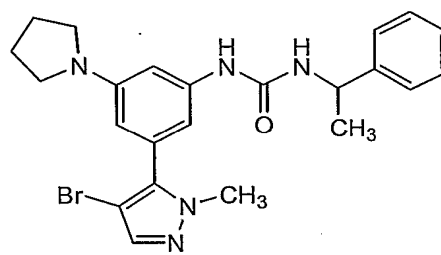
Compound 136



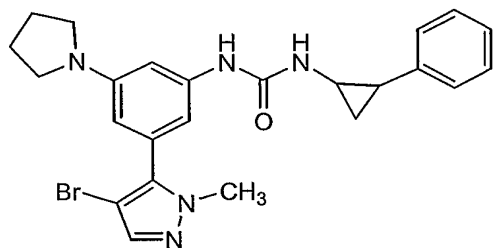
Compound 137



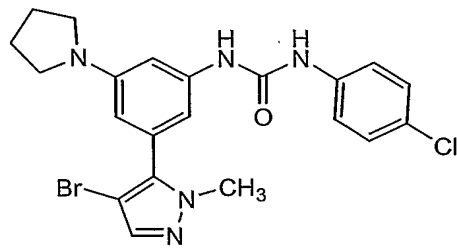
Compound 138



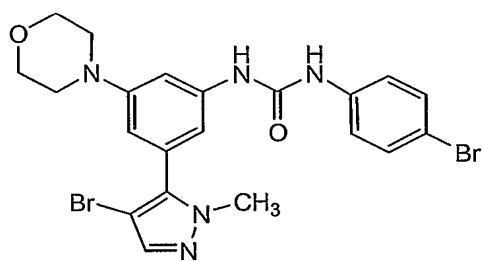
Compound 139



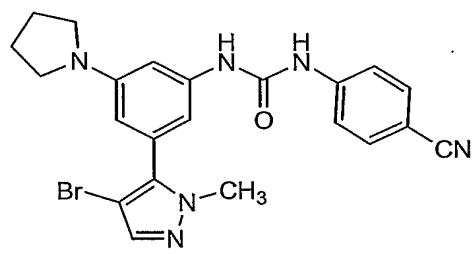
Compound 140



Compound 141



Compound 142

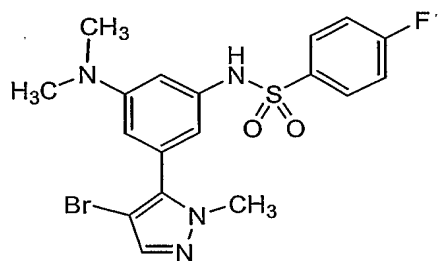


Compound 143

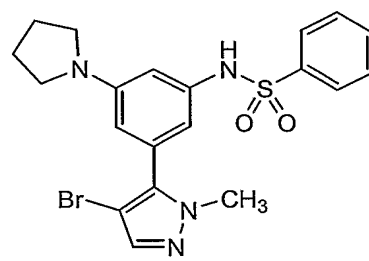
5

10

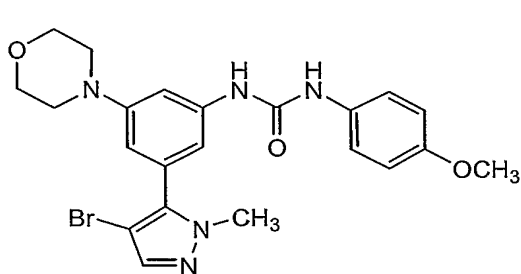
-109-



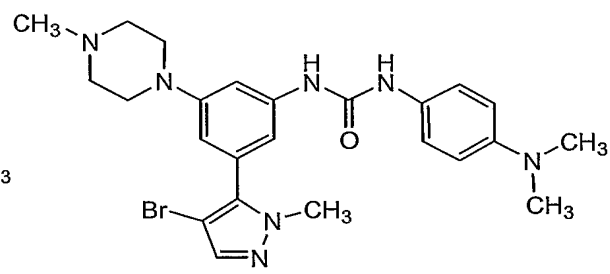
Compound 144



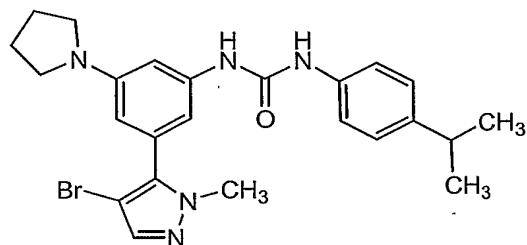
Compound 145



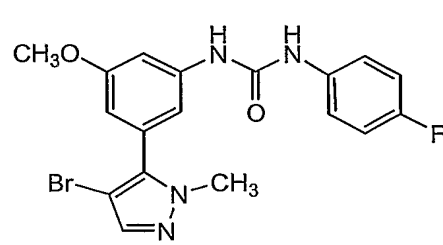
Compound 146



Compound 147

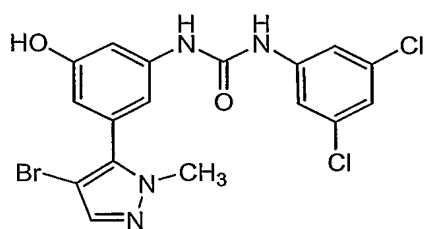


Compound 148

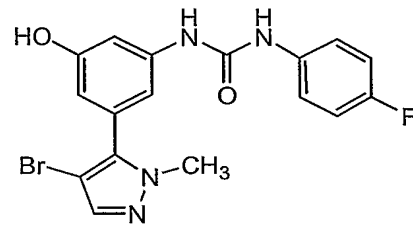


Compound 149

5

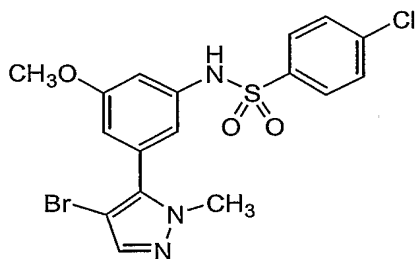


Compound 150

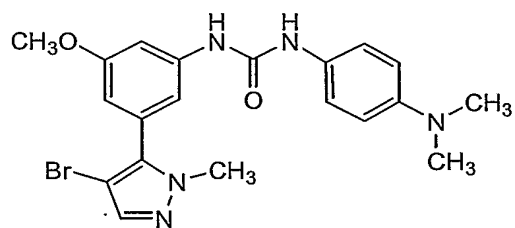


Compound 151

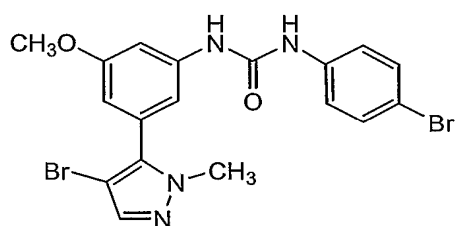
-110-



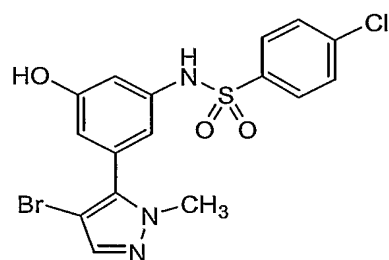
Compound 152



Compound 153

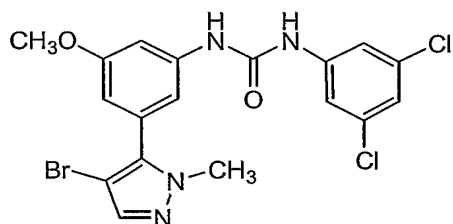


Compound 154

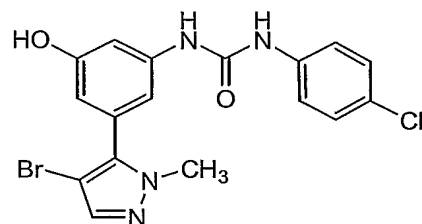


Compound 155

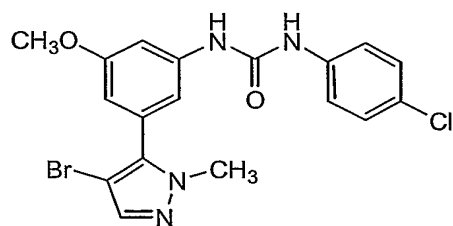
5



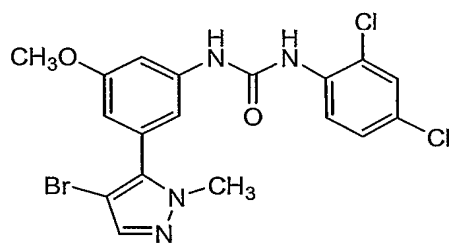
Compound 156



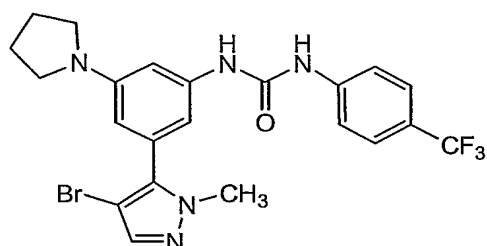
Compound 157



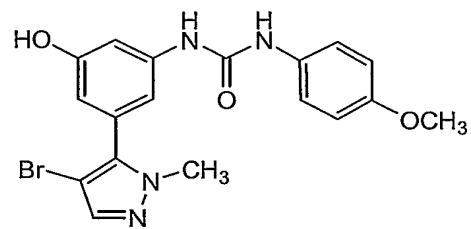
Compound 158



Compound 159



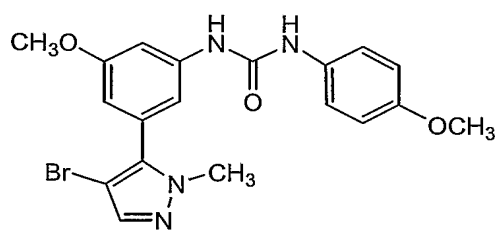
Compound 160



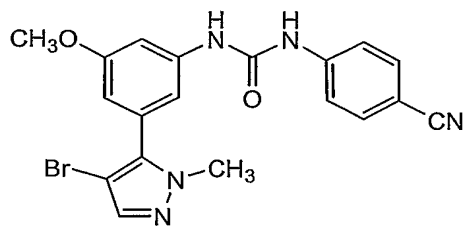
Compound 161

10

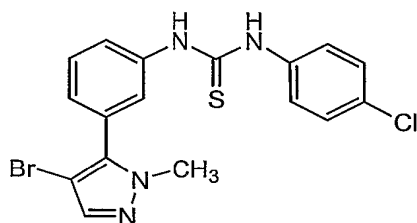
-111-



Compound 162



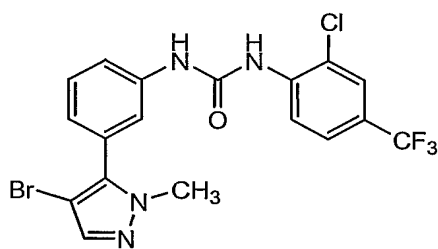
Compound 163



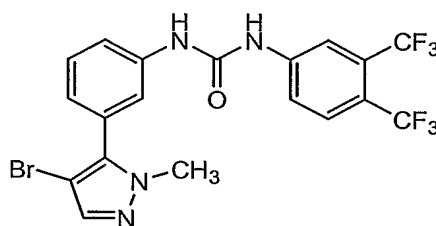
Compound 164

5

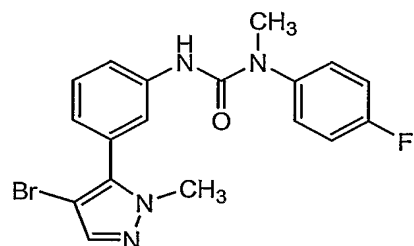
[0255] Other preferred compounds of the present invention include compounds of the following group:



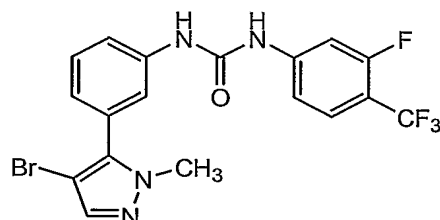
1-[3-(4-bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(2-chloro-4-trifluoromethyl-phenyl)-urea



1-(3,4-bis-trifluoromethyl-phenyl)-3-[3-(4-bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-urea

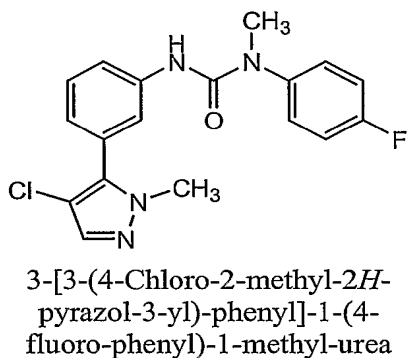
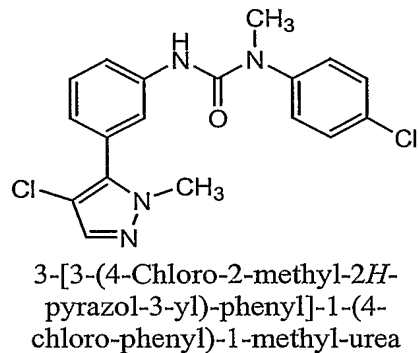
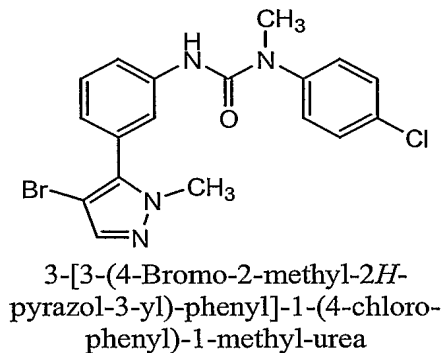


3-[3-(4-bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-1-(4-fluorophenyl)-1-methyl-urea



1-[3-(4-bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(3-fluoro-4-trifluoromethyl-phenyl)-urea

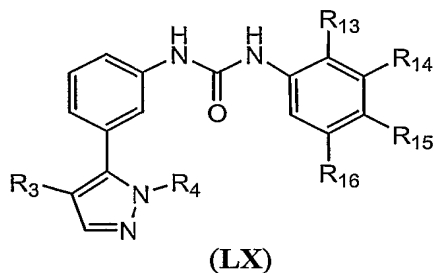
-112-



[0256] In some embodiments of each of the genera described herein, compounds of Example 13, Experiments 1-43, *infra*, and combinations or subcombinations thereof, are included.

5 [0257] In some embodiments of each of the genera described herein, compounds of Example 13, Experiments 1-43, *infra*, and combinations or subcombinations thereof, are not included.

[0258] Still other preferred compounds falling within the scope of the general Formula (I) have the Formula LX:



10 wherein:

- R<sub>3</sub> is Br or Cl;
- R<sub>4</sub> is lower alkyl;
- R<sub>10</sub> is H, F or CF<sub>3</sub>;

-113-

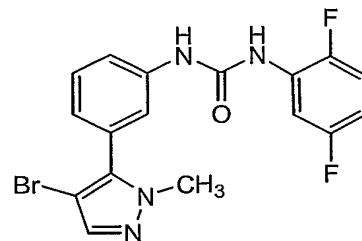
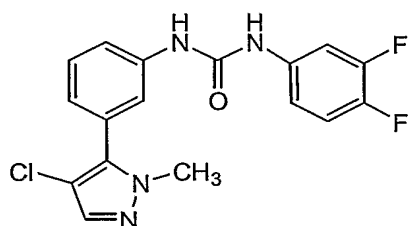
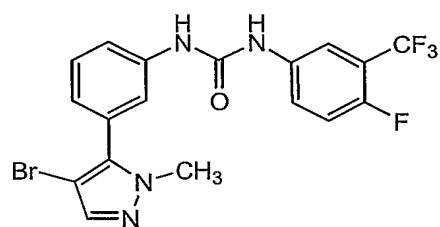
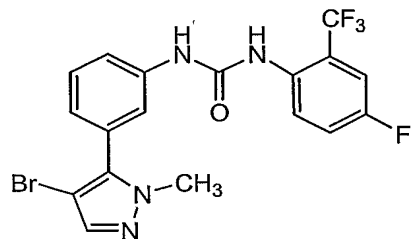
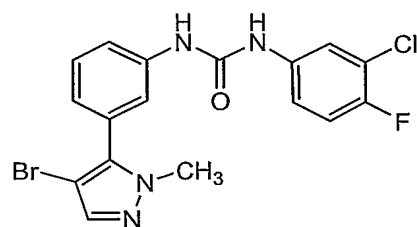
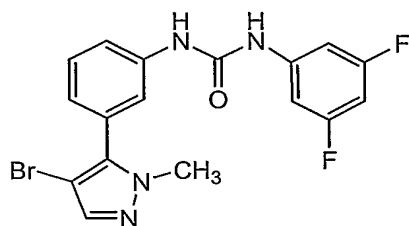
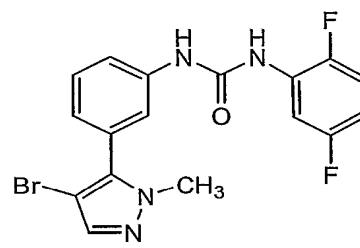
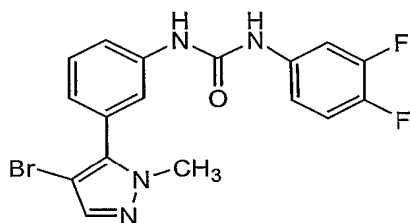
R<sub>11</sub> is H, F, Cl or CF<sub>3</sub>;

R<sub>12</sub> is H, F or Cl;

R<sub>13</sub> is H or F;

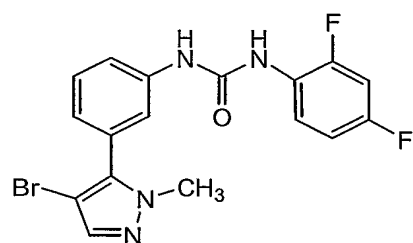
and combinations and subcombinations thereof.

5 [0259] Specifically preferred compounds of Formula (LX) above include the following:

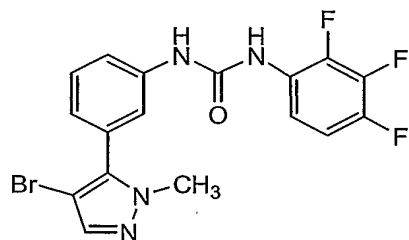


10

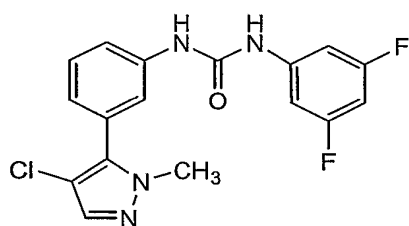
-114-



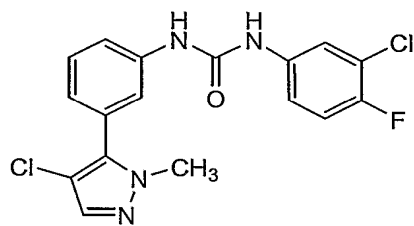
Compound 173



Compound 174

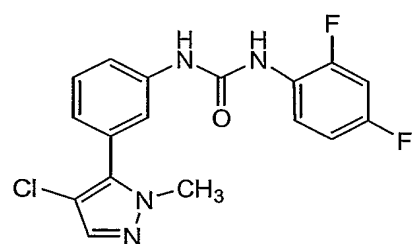


Compound 175

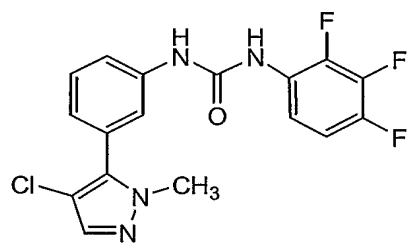


Compound 176

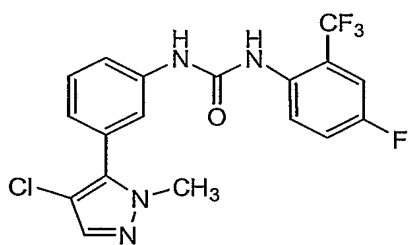
5



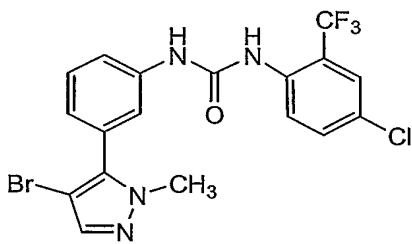
Compound 177



Compound 178



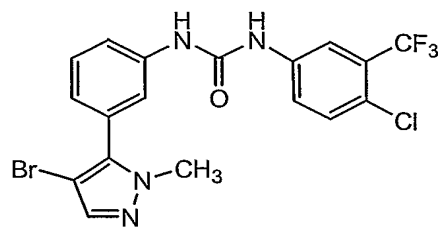
Compound 179



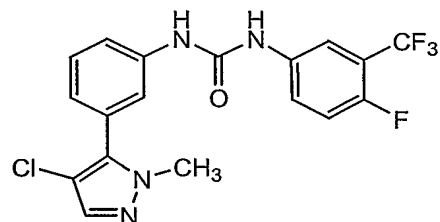
Compound 180



-115-



Compound 181



Compound 182

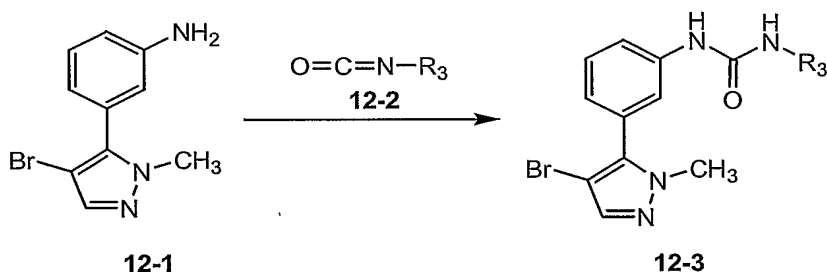
[0260] The IC<sub>50</sub> values for Compounds **165-182** ranged between 8 to 158 nM in the IP<sub>3</sub> AP-3 assay with their corresponding values shown below:

Compound No.	5-HT <sub>2A</sub> IC <sub>50</sub> (nM)
<b>165</b>	27
<b>166</b>	33
<b>167</b>	79
<b>168</b>	17
<b>169</b>	69
<b>170</b>	11
<b>171</b>	17
<b>172</b>	36
<b>173</b>	14
<b>174</b>	18
<b>175</b>	46
<b>176</b>	23
<b>177</b>	24
<b>178</b>	48
<b>179</b>	158
<b>180</b>	34
<b>181</b>	27
<b>182</b>	45

**EXAMPLE 12****GENERAL SYNTHETIC APPROACHES**

[0261] The compounds disclosed in this invention may be readily prepared in accordance to a variety of synthetic manipulations, all of which would be familiar to one skilled in the art.

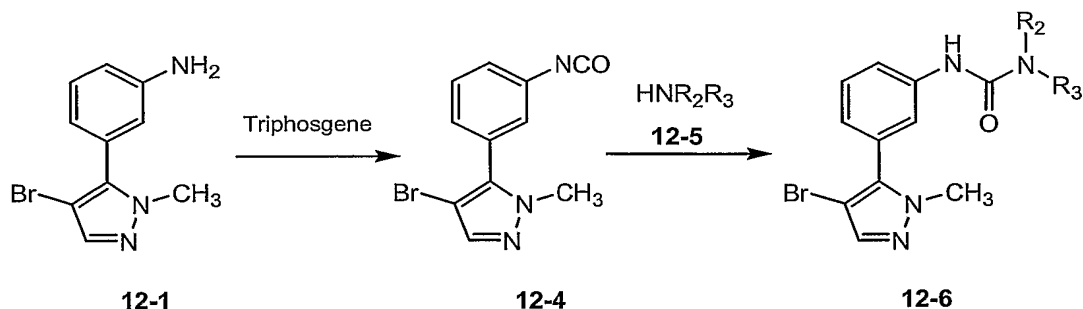
- 5 [0262] Compounds of general Formula (I) can be obtained *via* a variety of synthetic routes all of which would be familiar to one skilled in the art. The reaction of isocyanates with amines is a commonly practiced method for the formation of ureas (see Org. Syn. Coll. Vol. V, (1973), 555). Amine **12-1**, 3-(4-bromo-2-methylpyrazole-3-yl)phenylamine (sold commercially as 3-(4-bromo-1-methylpyrazole-3-yl)phenylamine, by Maybridge Chemical Company, Catalog No. KM01978, CAS  
10 No. 175201-77-1) reacts readily with isocyanates **12-2** in inert solvents such as halocarbons to yield the desired ureas of Formula **12-3** as shown in Scheme **12-1**.



Scheme 12-1

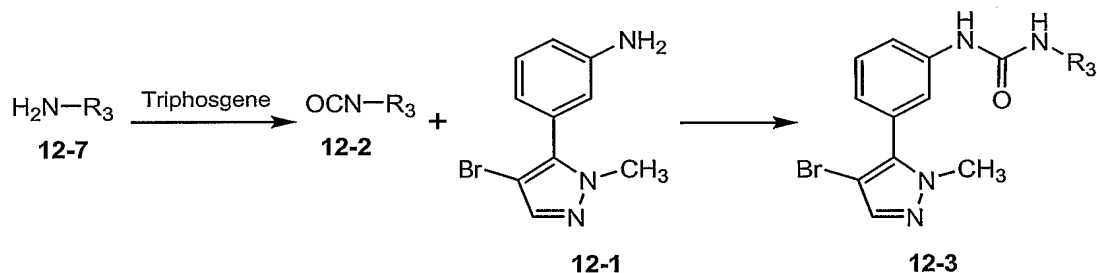
- [0263] Alternatively the amine **12-1** can be converted to the corresponding isocyanate **12-4** by the action of phosgene or a suitable phosgene equivalent, *e.g.* triphosgene, in an inert solvent such  
15 as a halocarbon in the presence of an organic base such as triethylamine (*i.e.*, TEA) or diisopropylethylamine (*i.e.*, DIEA). Isocyanate **12-4** reacts with amines of the general formula **12-5** in an analogous fashion to that described above in Scheme **12-1** to give urea **12-6**. This approach allows for diverse groups to be introduced for the R<sub>2</sub> or R<sub>3</sub> group based on the starting amine **12-5** (Scheme **12-2**).

-117-



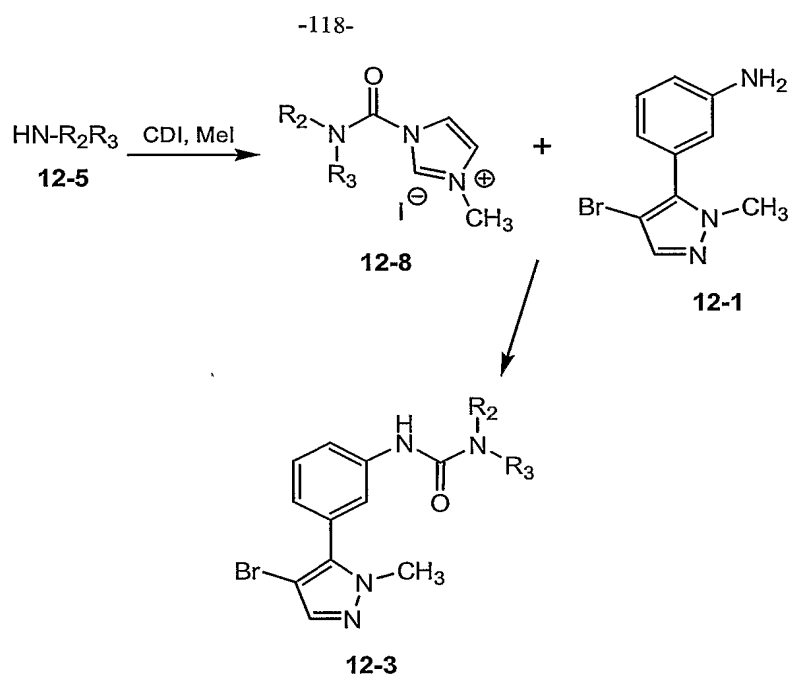
Scheme 12-2

[0264] Alternatively wherein the isocyanate of general formula 12-2 is not commercially available it can be prepared from the corresponding amine of general formula 12-7 in an analogous procedure to that described above for the preparation of 12-1. Reaction of these isocyanates with 12-1 would again yield the requisite ureas of general formula 12-3 (Scheme 12-3).



Scheme 12-3

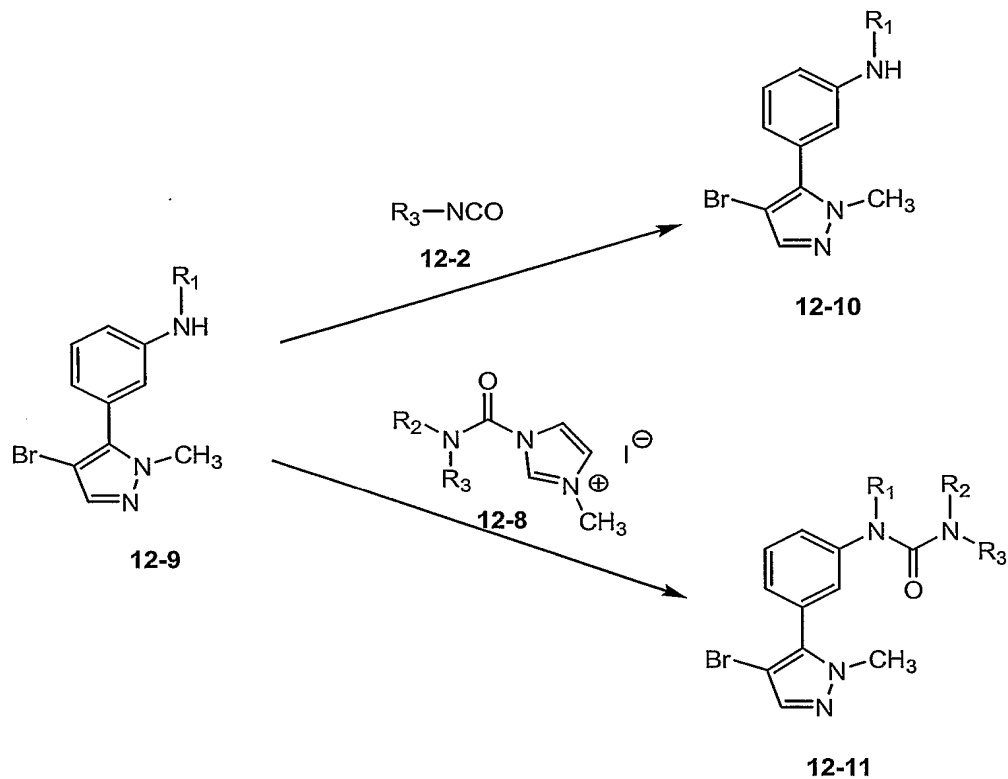
[0265] Amines of general formula 12-5 are also readily converted to activated isocyanate equivalents of general formula 12-8 by the sequential action of carbonyldiimidazole and methyl iodide in tetrahydrofuran and acetonitrile respectively (R.A. Batey *et al*, *Tetrahedron Lett.*, (1998), 39, 6267-6270.) Reaction of 12-8 with amine 12-1 in an inert solvent such as a halocarbon would yield the requisite ureas of general formula 12-3 (Scheme 12-4).



Scheme 12-4

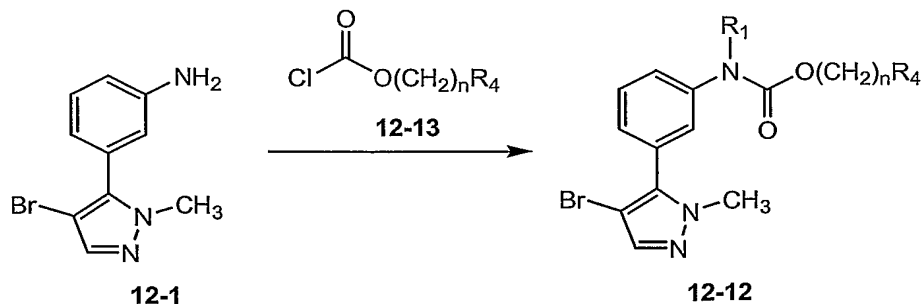
[0266] Amine **12-1** may be monomethylated according to the procedure of J. Barluenga *et al*, *J. Chem. Soc., Chem. Commun.*, (1984), 20, 1334-1335, or alkylated according to the procedure of P. Marchini *et al*, *J. Org. Chem.*, (1975), 40(23), 3453-3456, to yield compounds of general formula **12-9** wherein  $R^1$  = lower alkyl. Substituted amine **12-9** may be allowed to react with an isocyanate equivalent, either **12-2** or **12-8**, in a similar manner as described herein to give urea **12-10** or **12-11** respectively (Scheme 12-5).

-119-



Scheme 12-5

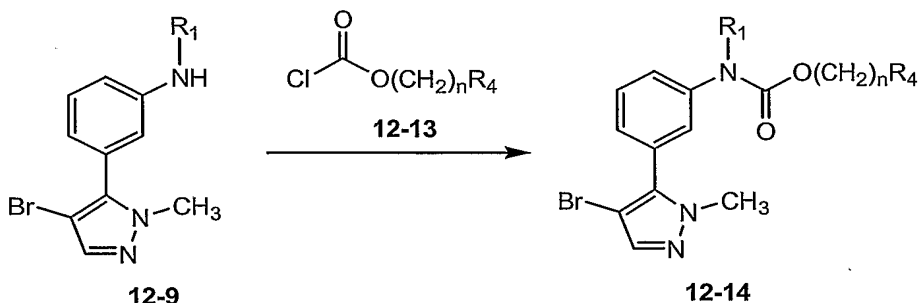
[0267] Carbamates of general formula **12-12** can be obtained in a similar manner via a variety of synthetic manipulations, all of which would be familiar to one skilled in the art. The reaction of amine **12-1** with chloroformates (see Org. Syn. Coll. Vol. IV, (1963), 780) of general formula **12-13** in an inert solvent such as ether or halocarbon in the presence of a tertiary base such as triethylamine or ethylisopropylamine readily yields the requisite carbamates of general formula **12-12** (Scheme 12-6).



Scheme 12-6

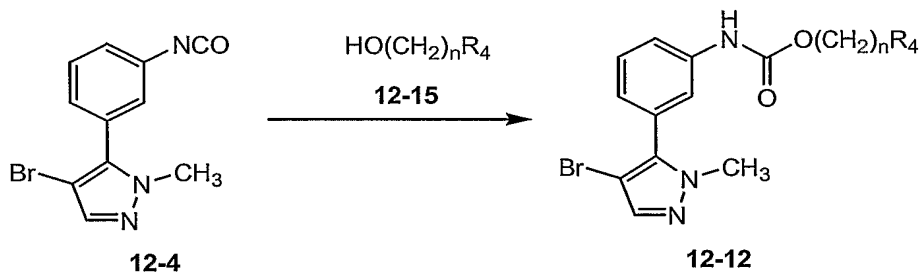
-120-

[0268] Analogously, amines of general formula 12-9 react similarly with chloroformates 12-13 to yield the requisite carbamates of the general formula 12-14 (Scheme 12-7).



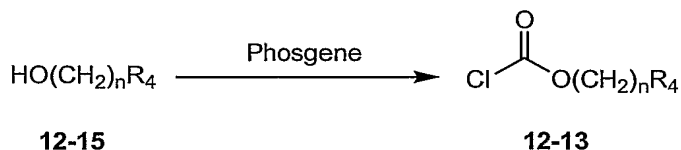
Scheme 12-7

5 [0269] An alternate route employs the ready reaction of an alcohol with an isocyanate. Thus isocyanate 12-4 described previously reacts readily with alcohols 12-15 in an aprotic solvent such as ether or chlorocarbon to yield the desired carbamates of general formula 12-12 (Scheme 12-8). :



Scheme 12-8

[0270] Chloroformates of general formula 12-13 not commercially available may be readily prepared from the corresponding alcohol 12-15 in an inert solvent such as toluene, chlorocarbon or ether by the action of excess phosgene (see Org. Syn. Coll. Vol. III, (1955), 167) (Scheme 12-9).

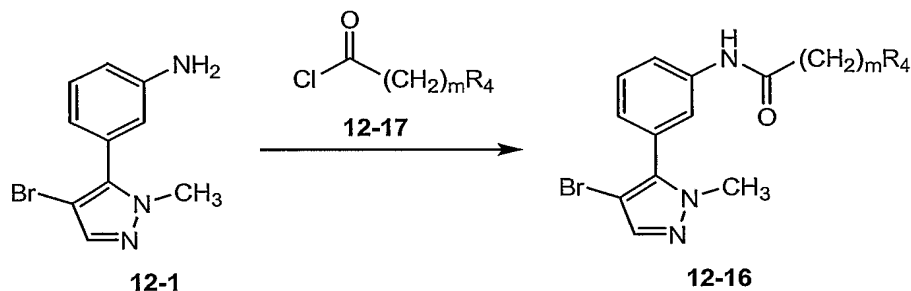


Scheme 12-9

[0271] Amide compounds of the general formula 12-16 can be obtained via a variety of synthetic manipulations, all of which would be familiar to one skilled in the art. The reaction of amine

-121-

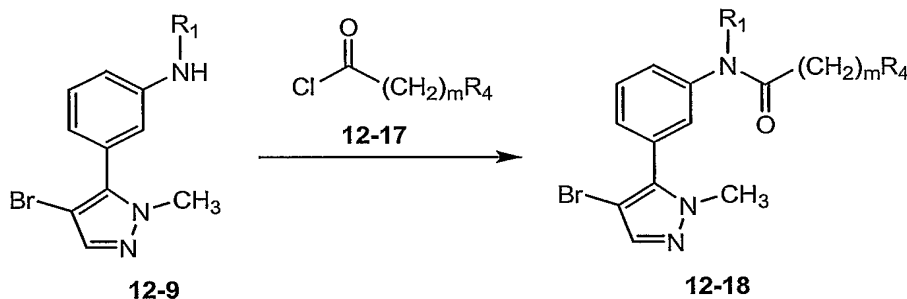
**12-1** with acid chlorides (see Org. Syn. Coll. V, (1973), 336) of general formula **12-17** to yield the desired amides **12-16** is readily achieved in an inert solvent such as chloroform or dichloromethane in the presence of an organic base such as triethylamine or ethyldiisopropylamine (Scheme **12-10**).



5

Scheme **12-10**

[0272] In an identical fashion amines of general formula **12-9** would react with acid chlorides **12-17** to yield the desired amides **12-18** (Scheme **12-11**).

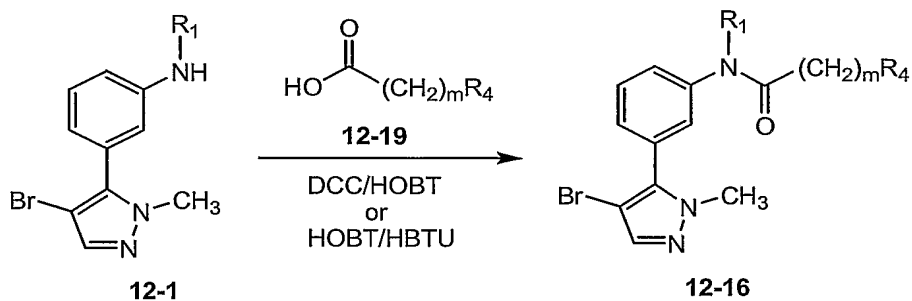
Scheme **12-11**

[0273] Alternatively the corresponding acids of general formula **12-19** may be coupled with dicyclohexylcarbodiimide (DCC)/hydroxybenzotriazole (HOBt) (see W. König et al, Chem. Ber., (1970), 103, 788) or hydroxybenzotriazole (HOBt)/2-(1H-benzotriazole-1-yl)-1,1,3,3-tetramethyluronium hexafluorophosphate (HBTU) (see M. Bernatowicz et al., Tetrahedron Lett., (1989), 30, 4645) as condensing agents in dimethylformamide or chloroform with amines **12-1** and **12-9** respectively to give amides **12-16** (Schemes **12-12**) and **12-18** (Scheme **12-13**) respectively as described above.

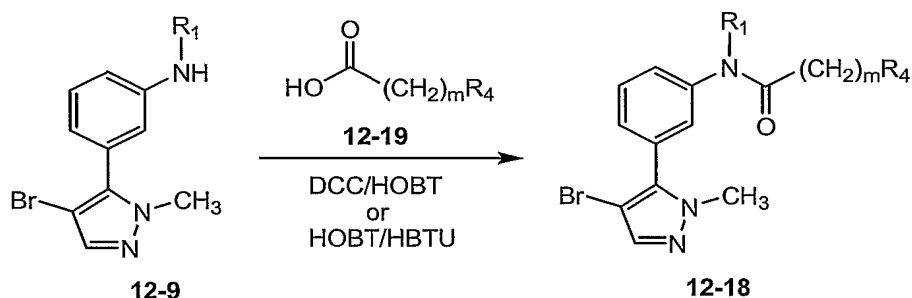
10

15

-122-

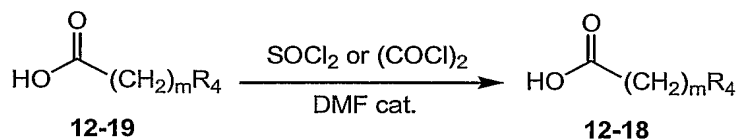


Scheme 12-12



Scheme 12-13

[0274] The acids of general formula **12-18** are readily converted to the corresponding acid chlorides **12-19** by the action of thionyl chloride or oxalyl chloride in the presence of catalytic dimethylformamide:



Scheme 12-14

[0275] A third aspect of the present invention provides a compound of Formula (I) or a solvate or physiologically functional derivative thereof for use as a therapeutic agent, specifically as a modifier of the activity of the serotonin 5-HT<sub>2A</sub> receptor. Modifiers of the activity of the serotonin 5-HT<sub>2A</sub> receptor are believed to be of potential use for the treatment or prophylaxis of CNS, gastrointestinal, cardiovascular, and inflammatory disorders. Compounds of the Formula (I) may be administered by oral, sublingual, parenteral, rectal, or topical administration. In addition to the neutral



-123-

forms of compounds of Formula (I) by appropriate addition of an ionizable substituent, which does not alter the receptor specificity of the compound, physiologically acceptable salts of the compounds may also be formed and used as therapeutic agents. Different amounts of the compounds of Formula (I) will be required to achieve the desired biological effect. The amount will depend on factors such as the specific compound, the use for which it is intended, the means of administration, and the condition of the treated individual. A typical dose may be expected to fall in the range of 0.001 to 200 mg per kilogram of body weight of the treated individual. Unit does may contain from 1 to 200 mg of the compounds of Formula (I) and may be administered one or more times a day, individually or in multiples. In the case of the salt or solvate of a compound of Formulas (I), the dose is based on the cation (for salts) or the unsolvated compound.

[0276] A fourth aspect of the present invention provides pharmaceutical compositions, comprising at least one compound of Formula (I) and/or an acceptable salt or solvate thereof (*e.g.*, a pharmaceutically acceptable salt or solvate) as an active ingredient combined with at least one carrier or excipient (*e.g.*, pharmaceutical carrier or excipient). Pharmaceutical compositions may be used in the treatment of clinical conditions for which a modifier of the activity of the serotonin 5-HT<sub>2A</sub> receptor is indicated, particularly where the active ingredient is preferentially selective for the 5-HT<sub>2A</sub> receptor over the 5-HT<sub>2A</sub> receptor, and most particularly where the active ingredient is also an inverse agonist at the 5-HT<sub>2A</sub> receptor. At least one compound of Formula (I) may be combined with the carrier in either solid or liquid form in a unit dose formulation. The pharmaceutical carrier must be compatible with the other ingredients in the composition and must be tolerated by the individual recipient. Other physiologically active ingredients may be incorporated into the pharmaceutical composition of the invention if desired, and if such ingredients are compatible with the other ingredients in the composition. Formulations may be prepared by any suitable method, typically by uniformly mixing the active compound(s) with liquids or finely divided solid carriers, or both, in the required proportions, and then, if necessary, forming the resulting mixture into a desired shape.

[0277] Conventional excipients, such as binding agents, fillers, acceptable wetting agents, tableting lubricants, and disintegrants may be used in tablets and capsules for oral administration. Liquid preparations for oral administration may be in the form of solutions, emulsions, aqueous or oily suspensions, and syrups. Alternatively, the oral preparations may be in the form of dry powder that can be reconstituted with water or another suitable liquid vehicle before use. Additional additives such as suspending or emulsifying agents, non-aqueous vehicles (including edible oils), preservatives, and flavorings and colorants may be added to the liquid preparations. Parenteral dosage forms may be prepared by dissolving the compound of the invention in a suitable liquid vehicle and filter sterilizing

-124-

the solution before filling and sealing an appropriate vial or ampoule. These are just a few examples of the many appropriate methods well known in the art for preparing dosage forms.

[0278] The fifth aspect of the present invention provides for the use of a compound of formula (I) in the preparation of a medicament for the treatment of a medical condition for which a modifier of the activity of the serotonin 5-HT<sub>2A</sub> receptor is indicated.

[0279] The sixth aspect of the present invention provides for a method of treatment of a clinical condition of a mammal, such as a human, for which a modifier of the activity of the serotonin 5-HT<sub>2A</sub> receptor is indicated, which comprises the administration to the mammal of a therapeutically effective amount of a compound of Formula (I) or a physiologically acceptable salt, solvate, or physiologically functional derivative thereof.

## EXPERIMENTAL DATA

### EXAMPLE 13

#### Preparation and Analysis of Compounds

#### Experiments 13.1 – 13.43

[0280] Mass spectra were recorded on a Micromass Platform™ LC with Gilson HPLC. Infra-red spectra were recorded on a Nicolet Avatar™ 360 FT-IR. Melting points were recorded on a Electrothermal IA9200™ apparatus and are uncorrected. Proton nuclear magnetic resonance spectra were recorded on a Bruker™ 300MHz machine. Chemical shifts are given with respect to tetramethylsilane. In the text the following abbreviations are used; s (singlet), d (doublet), t (triplet), m (multiplet) or combinations thereof. Chemical shifts are quoted in parts per million (ppm) and with coupling constants in Hertz.

[0281] Thin layer chromatography was carried out using aluminium backed silica plates (250μL; GF<sub>254</sub>). HPLC was recorded either on a HP Chemstation™ 1100 HPLC using a Hichrom 3.5 C18 reverse phase column (50mm x 2.1mm i.d.). Linear gradient elution over 5 minutes – 95% water (+0.1% TFA) / 5% acetonitrile (+0.05% TFA) down to 5% water / 95% acetonitrile. Flow rate 0.8mL/min (Method A); or on a Hichrom 3.5 C18 reverse phase column (100mm x 3.2mm i.d.). Linear gradient elution over 11 minutes – 95% water (+0.1% TFA) / 5% acetonitrile (+0.05% TFA) down to 5% water / 95% acetonitrile. Flow rate 1mL/min (Method B). Samples were routinely monitored at 254nm unless otherwise stated.

[0282] All reagents were purchased from commercial sources.

**Experiment 13.1****Preparation and Analysis of Compound 1**

N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)(4-methoxyphenoxy)carboxamide

5 [0283] To 4-methoxyphenylchloroformate (19 mg, 0.10 mmol) in CH<sub>2</sub>Cl<sub>2</sub> (0.5 mL) was added dropwise a solution of 3-(3-aminophenyl)-4-bromo-2-methylpyrazole (25 mg, 0.10 mmol) and triethylamine (14  $\mu$ L, 0.10 mmol) in CH<sub>2</sub>Cl<sub>2</sub> (0.5 mL). The mixture was stirred for 16 h and concentrated. Chromatography on flash silica (40% EtOAc/hexane) gave the title compound as a colourless solid (21 mg, 52%), m.p. 140.3-141.8°C. (EtOAc/hexane).

10 IR:  $\nu_{\max}$  = 1748, 1592, 1504, 1412, 1190, 835, 764, 676 cm<sup>-1</sup> MS (ES<sup>+</sup>): m/z (%) = 404 (M+H <sup>81</sup>Br, 100), 402 (M+H <sup>79</sup>Br, 90).

<sup>1</sup>H-NMR (CD<sub>3</sub> OD):  $\delta$  = 3.80 (3H, s, CH<sub>3</sub>), 3.81 (3H, s, CH<sub>3</sub>), 6.91-6.98 (2H, m, ArH), 7.07-7.18 (3H, m, ArH), 7.42-7.53 (4H, m, ArH).

[0284] HPLC: retention time 3.28 mins (Method A). Tlc: R<sub>f</sub> 0.4 (EtOAc/hexane).

15 **Experiment 13.2**

**Preparation and Analysis of Compound 2**

N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)(2-thienyl)carboxamide

20 [0285] To thiophene-2-carbonyl chloride (11  $\mu$ L, 0.09 mmol) in CH<sub>2</sub>Cl<sub>2</sub> (1 mL) was added dropwise a solution of 3-(3-aminophenyl)-4-bromo-2-methylpyrazole (25 mg, 0.09 mmol) and triethylamine (14  $\mu$ L, 0.09 mmol) in CH<sub>2</sub>Cl<sub>2</sub> (0.5 mL). The reaction mixture was stirred for 16 h and concentrated. Chromatography on flash silica (50% EtOAc/hexane) gave the title compound as a colourless solid (24 mg, 68%), m.p. 127.8-128.6°C (EtOAc/hexane). :

MS (ES<sup>+</sup>): m/z (%) = 364 (M+H <sup>81</sup>Br, 96), 362 (M+H <sup>79</sup>Br, 100).

25 <sup>1</sup>H-NMR (CD<sub>3</sub> OD):  $\delta$  = 3.81 (3H, s, CH<sub>3</sub>), 7.19 (2H, m, ArH), 7.48-7.58 (2H, m, ArH), 7.68-7.83 (3H, m, ArH), 7.93 (1H, dd, J=1.0, 3.8, ArH).

[0286] HPLC: retention time 3.12 min (Method A). TLC: R<sub>f</sub> 0.30 (30% EtOAc/hexane).

-126-

**Experiment 13.3****Preparation and Analysis of Compound 7**

N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)((4-trifluoromethoxy)phenyl) amino)carboxamide

[0287] This compound is commercially available from Maybridge Chemical Company,  
5 Catalog No. KM04515, under the name N-(3-(4-bromo-1-methylpyrazol-3-yl)phenyl)((4-trifluoromethoxy)phenyl) amino)carboxamide. :

**Experiment 13.4****Preparation and Analysis of Compound 10**

10 N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)((4-trifluoromethoxy)phenyl)methyl)amino)carboxamide

[0288] To a stirred solution of triphosgene (12 mg, 0.04 mmol) in CH<sub>2</sub>Cl<sub>2</sub> (0.5 mL) was added dropwise a solution of 3-(3-aminophenyl)-4-bromo-2-methylpyrazole (30 mg, 0.12 mmol) and triethylamine (33  $\mu$ L, 0.24 mmol) in CH<sub>2</sub>Cl<sub>2</sub> (0.5 mL). After 1 h, 4-(trifluoromethoxy)benzylamine  
15 (23 mg, 0.12 mmol) was added. The reaction mixture was stirred for 16 h and concentrated. Chromatography on flash silica (75% EtOAc/hexane) gave the title compound as a colourless solid (38 mg, 68%), m.p. 144.6-145.8 °C (EtOAc/hexane).

IR:  $\nu_{\max}$  = 1626, 1558, 1278, 1160, 969, 871, 789, 703 cm<sup>-1</sup> MS (ES<sup>+</sup>): m/z (%) = 471 (M+H <sup>81</sup>Br, 91), 469 (M+H <sup>79</sup>Br, 100).

20 <sup>1</sup>H-NMR (CD<sub>3</sub> OD):  $\delta$  = 3.81 (3H, s, CH<sub>3</sub>), 4.42 (2H, s, CH<sub>2</sub>), 7.06 (1H, d, J=7.1, ArH), 7.24 (2H, d, J=8.4, ArH), 7.37-7.52 (6H, m, ArH).

[0289] HPLC: retention time 3.06 mins (Method A). Tlc: R<sub>f</sub> 0.5 (EtOAc).

**Experiment 13.5****25 Preparation and Analysis of Compound 39**

((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(1,1-dimethylethoxy)carboxamide

[0290] To di-tert-butyl dicarbonate (36 mg, 0.17 mmol) in methanol (1 mL) was added dropwise a solution of 3-(3-aminophenyl)-4-bromo-2-methylpyrazole (42 mg, 0.17 mmol) in methanol (1 mL). The mixture was stirred for 16 h and concentrated. Chromatography on flash silica  
30 (40% EtOAc/hexane) gave the title compound as a colourless solid (29 mg, 49%) (EtOAc/hexane).

MS (CI<sup>-</sup>): m/z (%) = 352 (M-H <sup>81</sup>Br, 100), 350 (M-H <sup>79</sup>Br, 96).

-127-

<sup>1</sup>H-NMR (DMSO d<sub>6</sub>): δ =1.46 (9H, s, 3.times. CH<sub>3</sub>), 3.73 (3H, s, CH<sub>3</sub>), 7.07 (1H, m, ArH), 7.42 (1H, t, J=7.7, ArH), 7.53-7.60 (2H, m, ArH), 7.64 (1H, s, ArH), 9.57 (1H, s, NH).

[0291] HPLC: retention time 7.15 min (Method B).

## 5 Experiment 13.6

### Preparation and Analysis of Compound 40

N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)(4-trifluoromethoxyphenyl)carboxamide

[0292] To 4-(trifluoromethoxy)benzoyl chloride (19 μL, 0.12 mmol) in CH<sub>2</sub>Cl<sub>2</sub> (1 mL) was added dropwise a solution of 3-(3-aminophenyl)-4-bromo-2-methylpyrazole (30 mg, 0.12 mmol) and triethylamine (17 μL, 0.12 mmol) in CH<sub>2</sub>Cl<sub>2</sub> (0.5 mL). The reaction mixture was stirred for 16 h and concentrated. Chromatography on flash silica (50% EtOAc/hexane) gave the title compound as a colourless solid (40 mg, 76%), m.p. 138.6-139.6°C (EtOAc/hexane).

MS (ES<sup>+</sup>): m/z (%)=442 (M+H <sup>81</sup>Br, 93), 440 (M+H <sup>79</sup>Br, 100).

<sup>1</sup>H-NMR (DMSO d<sub>6</sub>): δ=3.79 (3H, s, CH<sub>3</sub>), 7.27 (1H, m, ArH), 7.45-7.60 (3H, m, ArH), 7.65 (1H, s, ArH), 7.87 (2H, m, ArH), 8.09 (2H, m, ArH), 10.51 (1H, s, NH).

[0293] HPLC: retention time 3.60 min (Method A). TLC: R<sub>f</sub> 0.40 (50% EtOAc/hexane).

## Experiment 13.7

### Preparation and Analysis of Compound 41

20 N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)(4-chlorophenyl)carboxamide

[0294] To 4-chlorobenzoyl chloride (15 mg, 0.08 mmol) in CH<sub>2</sub>Cl<sub>2</sub> (1 mL) was added dropwise a solution of 3-(3-aminophenyl)-4-bromo-2-methylpyrazole (21 mg, 0.08 mmol) and triethylamine (12 μL, 0.08 mmol) in CH<sub>2</sub>Cl<sub>2</sub> (0.5 mL). The mixture was stirred for 16 h and concentrated. Chromatography on flash silica (50% EtOAc/hexane) gave the title compound as a colourless solid (23 mg, 72%), m.p. 184.4-184.8 °C (EtOAc/hexane).

MS (ES<sup>+</sup>): m/z (%)=394 (M+H <sup>81</sup>Br <sup>37</sup>Cl, 34), 392 (M+H <sup>79</sup>Br <sup>37</sup>Cl (<sup>81</sup>Br <sup>35</sup>Cl), 100), 390 (M+H <sup>79</sup>Br <sup>35</sup>Cl, 67).

<sup>1</sup>H-NMR (DMSO d<sub>6</sub>): δ =3.79 (3H, s, CH<sub>3</sub>), 7.25 (1H, d, J=7.9, ArH), 7.51-7.6 (3H, m, ArH), 7.69 (1H, s, ArH), 7.90 (2H, m, ArH), 8.00 (2H, m, ArH), 10.51 (1H, s, NH).

30 [0295] HPLC: retention time 3.40 min (Method A). TLC: R<sub>f</sub> 0.35 (50% EtOAc/hexane).

**Experiment 13.8****Preparation and Analysis of Compound 42**

N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)-2-(4-(trifluoromethoxy)phenyl)acetamide

[0296] A solution of 3-(3-aminophenyl)-4-bromo-2-methylpyrazole (35 mg, 0.14 mmol) and triethylamine (23  $\mu$ L, 0.17 mmol) in DMF (0.5 mL) was added in one portion to a stirred solution of 4-trifluoromethoxyphenylacetic acid (31 mg, 0.14 mmol), HBTU (53 mg, 0.14 mmol) and HOBT (19 mg, 0.14 mmol) in DMF (1 mL). The mixture was heated at 70 °C for 24 h and then quenched with aqueous sodium bicarbonate solution. Ethyl acetate was added and the organic phase separated, washed with water (times.3), brine, dried (MgSO<sub>4</sub>) and evaporated.

10 [0297] Chromatography on flash silica (50% EtOAc/hexane) gave the title compound as a colourless solid (43 mg, 68%). m.p. 141.2-142.5 °C (EtOAc/hexane).

IR:  $\nu_{\max}$  = 1684, 1592, 1510, 1253, 1217, 1157, 987, 798, 700  $\text{cm}^{-1}$ .

MS (ES<sup>+</sup>): m/z (%) = 456 (M+H <sup>81</sup>Br, 100), 454 (M+H <sup>79</sup>Br, 94).

15 <sup>1</sup>H-NMR (DMSO d<sub>6</sub>):  $\delta$  = 3.72 (2H, s, CH<sub>2</sub>), 3.75 (3H, s, CH<sub>3</sub>), 7.17 (1H, d, J=7.7, ArH), 7.33 (2H, d, J=8.7, ArH), 7.38-7.51 (3H, m, ArH), 7.62-7.73 (3H, m, ArH), 10.44 (1H, s, NH).

[0298] HPLC: retention time 3.52 min (Method A).

**Experiment 13.9****Preparation and Analysis of Compound 43**

20 N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)-2-(3-fluorophenyl)acetamide

[0299] A mixture of 3-(3-aminophenyl)-4-bromo-2-methylpyrazole (30 mg, 0.12 mmol), 3-fluorophenylacetic acid (18 mg, 0.12 mmol), 1-hydroxybenzotriazole hydrate (16 mg, 0.12 mmol) and 2-(1H-benzotriazole-1-yl)-1,1,3,3-tetramethyluronium hexafluoro-phosphate (46 mg, 0.12 mmol) were dissolved in chloroform (1.5 ml). N,N-Diisopropylethylamine (0.02 ml, 0.13 mmol) was added and the mixture stirred at room temperature for 16 h. The reaction mixture was then poured into brine and the organic layer washed with further brine, dried over magnesium sulphate and then concentrated in vacuo. The crude product was purified by column chromatography (ethyl acetate-toluene, 1:1), giving the title compound (12 mg, 26%). R<sub>f</sub> 0.41 (ethyl acetate-toluene, 1:1).

MS (AP<sup>+</sup>): m/z (%) = 390 (M-H <sup>81</sup>Br 100), 388 (M-H <sup>79</sup>Br, 100).

30 <sup>1</sup>H-NMR (CDCl<sub>3</sub>):  $\delta$  = 3.77 (2H, s), 3.83 (3H, s), 7.02-7.20 (4H, m), 7.54 (1H, s), 7.60-7.63 (1H, m).

[0300] HPLC (Method B): retention time 7.07 min (100%).

**Experiment 13.10****Preparation and Analysis of Compound 44**

N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)-2-(3-methoxyphenyl)acetamide

- 5   **[0301]**       A solution of 3-methoxyphenylacetyl chloride (0.02 ml, 0.12 mmol) in dichloromethane (0.75ml) was added dropwise at 0 °C to a solution of 3-(3-aminophenyl)-4-bromo-2-methylpyrazole (30 mg, 0.12 mmol) and triethylamine (0.02 ml, 0.13 mmol) in dichloromethane (0.75 ml). The resulting mixture was stirred at room temperature for 16 h and then poured into brine. The organic layer was washed with more brine then dried over magnesium sulphate and concentrated in vacuo. The crude product was purified by column chromatography (ethyl acetate-toluene, 1:1), giving the title compound (9 mg, 19%). Rf 0.30 (ethyl acetate-toluene, 1:1).

MS (AP+): m/z (%)=402 (M+H <sup>81</sup>Br, 100), 400 (M+H <sup>79</sup>Br, 95).

<sup>1</sup>H-NMR (CDCl<sub>3</sub>): δ = 3.76 (2H, s), 3.82 (3H, s), 3.85 (3H, s), 6.84-6.90 (3H, m), 7.07-7.44 (5H, m), 7.53 (1H, s), 7.60 (1H, br s).

- 15   **[0302]**       HPLC (Method B): retention time 8.62 min (97.09%). δ<sub>H</sub> (CDCl<sub>3</sub>)

**Experiment 13.11****Preparation and Analysis of Compound 45**

N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)-2-(2-fluorophenyl)acetamide

- 20   **[0303]**       A mixture of 3-(3-aminophenyl)-4-bromo-2-methylpyrazole (30 mg, 0.12 mmol), 2-fluorophenylacetic acid (18 mg, 0.12 mmol), 1-hydroxybenzotriazole hydrate (16 mg, 0.12 mmol) and 2-(1H-benzotriazole-1-yl)-1,1,3,3-tetramethyluronium hexafluoro-phosphate (46 mg, 0.12 mmol) were dissolved in chloroform (1.5 ml). N,N-Diisopropylethylamine (0.02 ml, 0.13mmol) was added and the mixture stirred at room temperature for 16 h. The reaction mixture was then poured into brine and the organic layer washed with further brine, dried over magnesium sulphate and then concentrated in vacuo. The crude product was purified by column chromatography (ethyl acetate-toluene, 1:1), giving the title compound (15 mg, 32%). Rf 0.52 (ethyl acetate-toluene, 1:1).

MS (AP+): m/z (%)=390 (M+H <sup>81</sup>Br, 100), 388 (M+H <sup>79</sup>Br, 100).

- 25   <sup>1</sup>H-NMR (CDCl<sub>3</sub>): δ = 3.79 (2H, s), 3.83 (3H, s), 7.11-7.23 (3H, m), 7.30-7.55 (6H, m), 7.61-7.64 (1H, m).

30

- [0304]**       HPLC (Method B): retention time 7.28 min (100%).

**Experiment 13.12****Preparation and Analysis of Compound 46**

N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)-2-(4-nitrophenyl)acetamide

[0305] A mixture of 3-(3-aminophenyl)-4-bromo-2-methylpyrazole(30 mg, 0.12 mmol), 4-nitrophenylacetic acid (22 mg, 0.12 mmol), 1-hydroxybenzotriazole hydrate (16 mg, 0.12 mmol) and 2-(1H-benzotriazole-1-yl)-1,1,3,3-tetramethyluronium hexafluorophosphate (46 mg, 0.12 mmol) were dissolved in chloroform (1.5 ml). N,N-Diisopropylethylamine (0.02 ml, 0.13 mmol) was added and the mixture stirred at room temperature for 16 h. The reaction mixture was then poured into brine and the organic layer washed with further brine, dried over magnesium sulphate and then concentrated in vacuo. The crude product was purified by column chromatography (ethyl acetate-toluene, 1:1), giving the title compound (9 mg, 18%). Rf 0.19 (ethyl acetate-toluene, 1:1).

MS (AP+): m/z (%)=417 (M+H <sup>81</sup>Br, 100), 415 (M+H <sup>79</sup>Br, 100).

<sup>1</sup>H-NMR (CDCl<sub>3</sub>): δ = 3.83 (3H, s), 3.87 (2H, s), 7.18-7.23 (1H, m), 7.42-7.65 (7H, m), 8.22-8.30 (2H, m).

[0306] HPLC (Method B): retention time 7.22 min (94.30%).

**Experiment 13.13****Preparation and Analysis of Compound 47**

N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)-2-(2-methoxyphenyl)acetamide

[0307] A mixture of 3-(3-aminophenyl)-4-bromo-2-methylpyrazole(30 mg, 0.12 mmol), 2-methoxyphenylacetic acid (20 mg, 0.12 mmol), 1-hydroxybenzotriazole hydrate (16 mg, 0.12 mmol) and 2-(1H-benzotriazole-1-yl)-1,1,3,3-tetramethyluronium hexafluorophosphate (46 mg, 0.12 mmol) were dissolved in chloroform (1.5 ml). N,N-Diisopropylethylamine (0.02 ml, 0.13 mmol) was added and the mixture stirred at room temperature for 16 h. The reaction mixture was then poured into brine and the organic layer washed with further brine, dried over magnesium sulphate and then concentrated in vacuo. The crude product was purified by column chromatography (chloroform-methanol, 99:1), giving the title compound (18 mg, 38%) as a colourless solid. Rf 0.65 (chloroform-methanol, 98:2).

MS (AP-): m/z (%)=400 (M-H <sup>81</sup>Br, 90), 398 (M-H <sup>79</sup>Br, 100).

<sup>1</sup>H-NMR(CDCl<sub>3</sub>) δ=3.76 (2H, s), 3.83 (3H, s), 3.98 (3H, s), 6.97-7.06 (2H, m), 7.11-7.16 (1H, m), 7.31-7.50 (4H, m), 7.53 (1H, s), 7.57-7.60 (1H, m), 7.91 (1H, br s).

[0308] HPLC (Method B): retention time 7.16 min (100%).



-131-

[0309] One or the other (as indicated) of the two following synthetic protocols was used to generate each of the compounds below:

**Protocol A:**

5 [0310] To an isocyanate (1 mmol) in CH<sub>2</sub>Cl<sub>2</sub> (4 mL) was added dropwise a solution of 3-(3-aminophenyl)-4-bromo-2-methylpyrazole (1 mmol) in CH<sub>2</sub>Cl<sub>2</sub> (4 mL). The mixture was stirred for 16 hours and concentrated. Chromatography on flash silica (20%-80% EtOAc/hexane) followed by recrystallisation gave the pure urea.

**Protocol B:**

10 [0311] To a stirred solution of triphosgene (0.33 mmol) in CH<sub>2</sub>Cl<sub>2</sub> (4 mL) was added dropwise a solution of 3-(3-aminophenyl)-4-bromo-2-methylpyrazole (1 mmol) and triethylamine (2 mmol) in CH<sub>2</sub>Cl<sub>2</sub> (4 mL). After 1 hour, an aniline was added (1 mmol). The reaction mixture was stirred for 16 hours and concentrated. Chromatography on flash silica (20%-80% EtOAc/hexane) followed by recrystallisation gave the pure urea. :

15

**Experiment 13.14**

**Preparation and Analysis of Compound 11**

N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)((4-methylthiophenyl)amino)carboxamide

20 [0312] (Protocol A) – 4-(methylthio)phenyl isocyanate;  
colorless solid (EtOAc/hexane).  
MS (ES<sup>+</sup>): m/z (%) = 419 (M+H <sup>81</sup>Br, 100), 417 (M+H <sup>79</sup>Br, 94).  
<sup>1</sup>H-NMR (MeOH d<sub>4</sub>): δ = 2.42 (3H, s, SCH<sub>3</sub>), 3.81 (3H, s, NCH<sub>3</sub>), 7.06 (1H, m, ArH), 7.22 (2H, m, ArH), 7.37 (2H, m, ArH), 7.42-7.61 (4H, m, ArH).

[0313] HPLC: retention time 3.35 min (Method A).

25

**Experiment 13.15**

**Preparation and Analysis of Compound 8**

N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)((4-chlorophenyl)amino)carboxamide

30 [0314] (Protocol A) – 4-chlorophenyl isocyanate;  
colorless solid (EtOAc/hexane).

-132-

MS (ES<sup>+</sup>): *m/z* (%) = 409 (M+H <sup>81</sup>Br <sup>37</sup>Cl, 19), 407 (M+H <sup>79</sup>Br <sup>37</sup>Cl (<sup>81</sup>Br <sup>35</sup>Cl), 100), 405 (M+H <sup>79</sup>Br <sup>35</sup>Cl, 81).

<sup>1</sup>H-NMR (MeOH d<sub>4</sub>): δ = 3.81 (3H, s, CH<sub>3</sub>), 7.07 (1H, m, ArH), 7.23 (2H, m, ArH), 7.36-7.60 (6H, m, ArH).

5     **[0315]**           HPLC: retention time 3.42 min (Method A).

#### Experiment 13.16

##### Preparation and Analysis of Compound 9

((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(4-fluorophenyl)carboxamide

10    **[0316]**           (Protocol A) – 4-fluorophenyl isocyanate;  
colorless solid (EtOAc/hexane).  
MS (ES<sup>+</sup>): *m/z* (%) = 391 (M+H <sup>81</sup>Br, 96), 389 (M+H <sup>79</sup>Br, 100).  
<sup>1</sup>H-NMR (MeOH d<sub>4</sub>): δ = 3.81 (3H, s, CH<sub>3</sub>), 6.93-7.11 (3H, m, ArH), 7.37-7.61 (6H, m, ArH).

15    **[0317]**           HPLC: retention time 3.11 min.

#### Experiment 13.17

##### Preparation and Analysis of Compound 12

((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(2-(trifluoromethoxy)phenyl)carboxamide

20    **[0318]**           (Protocol A) - 2-(trifluoromethoxy)phenyl isocyanate;  
colorless solid (EtOAc/hexane).  
MS (ES<sup>+</sup>): *m/z* (%) = 457 (M+H <sup>81</sup>Br, 100), 455 (M+H <sup>79</sup>Br, 95).  
<sup>1</sup>H-NMR (DMSO d<sub>6</sub>): δ = 3.79 (3H, s, CH<sub>3</sub>), 7.06-7.18 (2H, m, ArH), 7.38-7.49 (2H, m, ArH), 7.51-7.62 (2H, m, ArH), 7.65 (1H, m, ArH), 7.71 (1H, s, ArH), 8.24 (1H, dd, J=1.1, 8.2, ArH), 8.56 (1H, s, NH), 9.49 (1H, s, NH).

25

**[0319]**           HPLC: retention time 3.40 min.

#### Experiment 13.18

##### Preparation and Analysis of Compound 13

30           ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(2-nitrophenyl)carboxamide

**[0320]**           (Protocol A) - 2-nitrophenyl isocyanate;

-133-

yellow solid (EtOAc/hexane).

MS (ES<sup>+</sup>):  $m/z$  (%) = 418 (M+H <sup>81</sup>Br, 98), 416 (M+H <sup>79</sup>Br, 100).

<sup>1</sup>H-NMR (DMSO *d*<sub>6</sub>):  $\delta$  = 3.79 (3H, s, NCH<sub>3</sub>), 7.14 (1H, m, ArH), 7.24 (1H, m, ArH), 7.50 (1H, t, J=7.7, ArH), 7.60 (2H, m, ArH), 7.67 (1H, s, ArH), 7.71 (1H, s, ArH), 8.10 (1H, m, ArH), 8.29 (1H, m, ArH), 9.65 (1H, s, NH), 10.09 (1H, s, NH).

[0321] HPLC: retention time 3.10 min (Method A).

### Experiment 13.19

#### Preparation and Analysis of Compound 14

10 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(4-methoxyphenyl)carboxamide

[0322] (Protocol A) – 4-methoxyphenyl isocyanate;  
colorless solid (EtOAc/hexane).

MS (ES<sup>+</sup>):  $m/z$  (%) = 403 (M+H <sup>81</sup>Br, 100), 401 (M+H <sup>79</sup>Br, 96).

15 <sup>1</sup>H-NMR (DMSO *d*<sub>6</sub>):  $\delta$  = 3.71 (3H, s, OCH<sub>3</sub>), 3.79 (3H, s, NCH<sub>3</sub>), 6.87 (2H, d, J=8.9, ArH), 7.06 (1H, d, J=7.5, ArH), 7.39 (2H, d, J=8.9, ArH), 7.45-7.61 (3H, m, ArH), 7.65 (1H, s, ArH), 8.52 (1H, s, NH), 8.84 (1H, s, NH).

[0323] HPLC: retention time 3.08 min.

### Experiment 13.20

#### 20 Preparation and Analysis of Compound 15

((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(2-methylphenyl)carboxamide

[0324] (Protocol A) – *o*-tolyl isocyanate;  
colorless solid (EtOAc/hexane).

MS (ES<sup>+</sup>):  $m/z$  (%) = 387 (M+H <sup>81</sup>Br, 94), 385 (M+H <sup>79</sup>Br, 100).

25 <sup>1</sup>H-NMR (MeOH *d*<sub>4</sub>):  $\delta$  = 2.29 (3H, s, CH<sub>3</sub>), 3.81 (3H, s, NCH<sub>3</sub>), 7.03 (1H, dt, J=1.1, 7.5, ArH), 7.09 (1H, dt, J=1.1, 7.5, ArH), 7.13-7.22 (2H, m, ArH), 7.45 (1H, t, J=7.9, ArH), 7.49-7.57 (2H, m, ArH), 7.60-7.68 (2H, m, ArH).

[0325] HPLC: retention time 2.96 min.

-134-

**Experiment 13.21****Preparation and Analysis of Compound 16**

((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(4-(trifluoromethyl)phenyl)carboxamide

[0326] (Protocol A) – 4-(trifluoromethyl)phenyl isocyanate;

5 colorless solid (EtOAc/hexane).

MS (ES+):  $m/z$  (%) = 441 (M+H <sup>81</sup>Br, 94), 439 (M+H <sup>79</sup>Br, 100).

<sup>1</sup>H-NMR (MeOH d<sub>4</sub>):  $\delta$  = 3.82 (3H, s, CH<sub>3</sub>), 7.04-7.16 (3H, m, ArH), 7.20-7.47 (6H, m, ArH).

[0327] HPLC: retention time 3.56 min. :

10

**Experiment 13.22****Preparation and Analysis of Compound 17**

((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(3-chlorophenyl)carboxamide

[0328] (Protocol A) – 3-chlorophenyl isocyanate;

15 colorless solid (EtOAc/hexane).

MS (ES+):  $m/z$  (%) = 409 (M+H <sup>81</sup>Br <sup>37</sup>Cl, 26), 407 (M+H <sup>79</sup>Br <sup>37</sup>Cl (<sup>81</sup>Br <sup>35</sup>Cl), 100), 405 (M+H <sup>79</sup>Br <sup>35</sup>Cl, 70).

<sup>1</sup>H-NMR (MeOH d<sub>4</sub>):  $\delta$  = 3.81 (3H, s, NCH<sub>3</sub>), 7.04 (1H, m, ArH), 7.10 (1H, m, ArH), 7.28 (2H, m, ArH), 7.47 (1H, t, J=7.8, ArH), 7.55 (1H, m, ArH), 7.63 (1H, m, ArH), 7.68 (1H, s, ArH), 7.73 (1H, m, ArH), 9.04 (2H, s, NH).

20

[0329] HPLC: retention time 3.20 min (Method A).

**Experiment 13.23****Preparation and Analysis of Compound 18**

25 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(2-chlorophenyl)carboxamide

[0330] (Protocol A) – 2-chlorophenyl isocyanate;

colorless solid (EtOAc/hexane).

MS (ES+):  $m/z$  (%) = 409 (M+H <sup>81</sup>Br <sup>37</sup>Cl, 24), 407 (M+H <sup>79</sup>Br <sup>37</sup>Cl (<sup>81</sup>Br <sup>35</sup>Cl), 100), 405 (M+H <sup>79</sup>Br <sup>35</sup>Cl, 72).

30

<sup>1</sup>H-NMR (MeOH d<sub>4</sub>):  $\delta$  = 3.81 (3H, s, NCH<sub>3</sub>), 7.03 (1H, m, ArH), 7.11 (1H, m, ArH), 7.28 (1H, m, ArH), 7.35-7.53 (3H, m, ArH), 7.55 (1H, s, ArH), 7.62 (1H, m, ArH), 8.11 (1H, m, ArH).

-135-

[0331] HPLC: retention time 3.13 min.

#### Experiment 13.24

##### Preparation and Analysis of Compound 19

5 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(4-(methylethyl)phenyl)carboxamide

[0332] (Protocol A) – 4-isopropylphenyl isocyanate;

colorless solid (THF/hexane).

MS (ES+):  $m/z$  (%) = 415 (M+H  $^{81}\text{Br}$ , 100), 413 (M+H  $^{79}\text{Br}$ , 92).

10  $^1\text{H-NMR}$  (MeOH  $d_4$ ):  $\delta$  = 1.23 (6H, d,  $J=6.8$ ,  $2\times\text{CH}_3$ ), 2.86 (1H, septet,  $J=6.8$ , CH),  
3.82 (3H, s,  $\text{NCH}_3$ ), 7.09 (1H, m, ArH), 7.16 (2H, d,  $J=7.6$ , ArH), 7.31 (2H, d,  $J=7.6$ , ArH),  
7.42-7.51 (2H, m, ArH), 7.54 (1H, s, ArH), 7.59 (1H, m, ArH).

[0333] HPLC: retention time 3.66 min.

#### Experiment 13.25

##### 15 Preparation and Analysis of Compound 20

((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(3-methoxyphenyl)carboxamide

[0334] (Protocol A) – 3-methoxyphenyl isocyanate;

colorless solid (EtOAc/hexane).

MS (ES+):  $m/z$  (%) = 403 (M+H  $^{81}\text{Br}$ , 100), 401 (M+H  $^{79}\text{Br}$ , 96).

20  $^1\text{H-NMR}$  (MeOH  $d_4$ ):  $\delta$  = 3.73 (3H, s,  $\text{OCH}_3$ ), 3.81 (3H, s,  $\text{NCH}_3$ ), 6.59 (1H, m, ArH), 6.91 (1H, m, ArH), 7.08 (1H, m, ArH), 7.14 (2H, m, ArH), 7.39-7.61 (4H, m, ArH).

[0335] HPLC: retention time 2.90 min.

#### Experiment 13.26

##### 25 Preparation and Analysis of Compound 21

((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(3-methylphenyl)carboxamide

[0336] (Protocol A) – *m*-tolyl isocyanate; :

colorless solid (EtOAc/hexane).

MS (ES+):  $m/z$  (%) = 387 (M+H  $^{81}\text{Br}$ , 100), 385 (M+H  $^{79}\text{Br}$ , 96).

30  $^1\text{H-NMR}$  (DMSO  $d_6$ ):  $\delta$  = 2.26 (3H, s,  $\text{CH}_3$ ), 3.76 (3H, s,  $\text{NCH}_3$ ), 6.79 (1H, m, ArH),  
7.06-7.22 (3H, m, ArH), 7.29 (1H, m, ArH), 7.43-7.62 (3H, m, ArH), 7.68 (1H, s, ArH), 8.65  
(1H, s, NH), 8.89 (1H, s, NH).

-136-

[0337] HPLC: retention time 3.05 min (Method A).

**Experiment 13.27****Preparation and Analysis of Compound 22**

5 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-methyl-N-(4-(trifluoromethoxy)phenyl)-carboxamide

[0338] (Protocol B) – N-methyl-4-(trifluoromethoxy)aniline;  
pale yellow solid (EtOAc/hexane).

MS (ES+):  $m/z$  (%) = 471 (M+H <sup>81</sup>Br, 88), 469 (M+H <sup>79</sup>Br, 100).

10 <sup>1</sup>H-NMR (MeOH d<sub>4</sub>):  $\delta$  = 3.35 (3H, s, NCH<sub>3</sub>), 3.81 (3H, s, NCH<sub>3</sub>), 7.09 (1H, m, ArH), 7.25-7.51 (8H, m, ArH).

[0339] HPLC: retention time 3.56 min (Method A).

**Experiment 13.28**

15 **Preparation and Analysis of Compound 23**

N-(4-(tert-butyl)phenyl)((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)carboxamide  
(Protocol B) – 4-*tert*-butylaniline;

[0340] colorless solid (EtOAc/hexane).

MS (ES+):  $m/z$  (%) = 429 (M+H <sup>81</sup>Br, 98), 427 (M+H <sup>79</sup>Br, 100).

20 <sup>1</sup>H-NMR (DMSO d<sub>6</sub>):  $\delta$  = 1.27 (9H, s, 3xCH<sub>3</sub>), 3.79 (3H, s, NCH<sub>3</sub>), 7.07 (1H, d, J=7.5, ArH), 7.29 (2H, d, J=8.7, ArH), 7.37 (2H, d, J=8.7, ArH), 7.45 (1H, t, J=7.5, ArH), 7.51-7.60 (2H, m, ArH), 7.66 (1H, s, ArH), 8.65 (1H, s, NH), 8.83 (1H, s, NH).

[0341] HPLC: retention time 3.77 min.

25 **Experiment 13.29**

**Preparation and Analysis of Compound 24**

N-(4-(dimethylamino)phenyl)((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)carboxamide  
(Protocol B) – *N,N*-dimethyl-*p*-phenylenediamine;

[0342] colorless solid (EtOAc/hexane).

30 MS (ES+):  $m/z$  (%) = 416 (M+H <sup>81</sup>Br, 96), 414 (M+H <sup>79</sup>Br, 100).

-137-

<sup>1</sup>H-NMR (DMSO d<sub>6</sub>): δ = 2.86 (6H, s, NCH<sub>3</sub>), 3.80 (3H, s, NCH<sub>3</sub>), 6.80 (2H, m, ArH), 7.09 (1H, d, J=7.7, ArH), 7.28 (2H, m, ArH), 7.42 (1H, t, J=7.8, ArH), 7.52 (1H, m, ArH), 7.59 (1H, s, ArH), 7.67 (1H, s, ArH), 8.45 (1H, s, NH), 8.75 (1H, s, NH).

[0343] HPLC: retention time 2.07 min (Method A).

5

### Experiment 13.30

#### Preparation and Analysis of Compound 25

N-(3,5-dichloro-4-methylphenyl)((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino) carboxamide (Protocol B) – 3,5-dichloro-4-methylphenylamine;

10 [0344] colorless solid (EtOAc/hexane).

MS (ES<sup>+</sup>): *m/z* (%) = 457 (M+H, 35), 455 (M+H, 100), 453 (M+H, 65).

<sup>1</sup>H-NMR (DMSO d<sub>6</sub>): δ = 2.32 (3H, s, CH<sub>3</sub>), 3.79 (3H, s, NCH<sub>3</sub>), 7.11 (1H, d, J=7.4, ArH), 7.46 (1H, t, J=7.8, ArH), 7.50-7.64 (4H, m, ArH), 7.68 (1H, s, ArH), 9.02 (1H, s, NH), 9.09 (1H, s, NH).

15 [0345] HPLC: retention time 3.66 min.

### Experiment 13.31

#### Preparation and Analysis of Compound 26

((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(4-(trifluoromethylthio)phenyl) carboxamide (Protocol B) – 4-(trifluoromethylthio)aniline;

20

[0346] colorless solid (EtOAc/hexane).

MS (ES<sup>+</sup>): *m/z* (%) = 473 (M+H <sup>81</sup>Br, 100), 471 (M+H <sup>79</sup>Br, 94).

<sup>1</sup>H-NMR (DMSO d<sub>6</sub>): δ = 3.81 (3H, s, NCH<sub>3</sub>), 7.11 (1H, d, J=7.5, ArH), 7.47 (1H, t, J=7.9, ArH), 7.51-7.63 (6H, m, ArH), 7.66 (1H, s, ArH), 9.03 (1H, s, NH), 9.16 (1H, s, NH).

25 HPLC: retention time 3.76 min.

### Experiment 13.32

#### Preparation and Analysis of Compound 31

((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(cyclohexyl)carboxamide

30 [0347] (Protocol B) – cyclohexylamine; :

colorless solid, m.p. 155.5-156.3°C (EtOAc/hexane).

MS (ES<sup>+</sup>): *m/z* (%) = 379 (M+H <sup>81</sup>Br, 93), 377 (M+H <sup>79</sup>Br, 100).

-138-

<sup>1</sup>H-NMR (DMSO d<sub>6</sub>): δ = 1.07-1.34 (5H, m, 5xCH), 1.52 (1H, m, CH), 1.63 (2H, m, 2xCH), 1.76 (2H, m, 2xCH), 3.48 (1H, m, NCH), 3.74 (3H, s, CH<sub>3</sub>), 6.15 (1H, d, J=7.8, ArH), 6.98 (1H, d, J=7.5, ArH), 7.32-7.43 (2H, m, ArH), 7.51 (1H, m, NH), 7.62 (1H, s, ArH), 8.50 (1H, s, NH).

- 5    [0348]            HPLC: retention time 3.16 min (Method A). :  
                      TLC: retention factor 0.35 (50% EtOAc/hexane).

### Experiment 13.33

#### Preparation and Analysis of Compound 32

- 10                    ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(phenylmethyl)carboxamide

- [0349]            (Protocol B) – benzylamine;  
                      colorless solid, m.p. 144.5-146.2°C (EtOAc/hexane).  
                      IR: <sub>max</sub> = 1622, 1565, 1467, 1374, 1239, 973, 802, 752, 695 cm<sup>-1</sup>.  
                      MS (ES+): *m/z* (%) = 387 (M+H <sup>81</sup>Br, 89), 385 (M+H <sup>79</sup>Br, 100).  
15                    <sup>1</sup>H-NMR (CD<sub>3</sub>OD): δ = 3.81 (3H, s, CH<sub>3</sub>), 4.40 (2H, s, CH<sub>2</sub>), 7.05 (1H, m, ArH),  
                      7.19-7.51 (9H, m, ArH).

- [0350]            HPLC: retention time 3.06 min (Method A).

### Experiment 13.34

#### 20    Preparation and Analysis of Compound 27

                      ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(2-fluorophenyl)carboxamide

- [0351]            (Protocol A) – 2-fluorophenyl isocyanate;  
                      colorless solid (DCM/hexane).  
                      MS (ES+): *m/z* (%) = 391 (M+H <sup>81</sup>Br, 100), 389 (M+H <sup>79</sup>Br, 90).  
25                    <sup>1</sup>H-NMR (MeOH d<sub>4</sub>): δ = 3.79 (3H, s, NCH<sub>3</sub>), 7.00-7.11 (4H, m, ArH), 7.40-7.56  
                      (3H, m, ArH), 7.61 (1H, m, ArH), 8.09 (1H, m, ArH).

- [0352]            HPLC: retention time 3.01 min.

### Experiment 13.35

#### 30    Preparation and Analysis of Compound 28

                      2-(((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)-amino)carbonylamino)benzamide



-139-

[0353] (Protocol B) – 2-aminobenzamide;  
colorless solid (EtOAc/hexane).

MS (ES<sup>+</sup>):  $m/z$  (%) = 399 (M+H - 17 <sup>81</sup>Br, 100), 397 (M+H - 17 <sup>79</sup>Br, 94).

5 <sup>1</sup>H-NMR (DMSO d<sub>6</sub>):  $\delta$  = 3.79 (3H, s, NCH<sub>3</sub>), 6.93-7.10 (2H, m, ArH), 7.45 (2H, t, J=7.8, ArH), 7.59-7.72 (5H, m, ArH), 8.22 (2H, m), 9.92 (1H, s, NH), 10.69 (1H, s, NH).

[0354] HPLC: retention time 2.88 min.

### Experiment 13.36

#### Preparation and Analysis of Compound 29

10 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(4-cyanophenyl)carboxamide

[0355] (Protocol B) – 4-aminobenzonitrile;  
colorless solid (EtOAc/hexane).

MS (ES<sup>+</sup>):  $m/z$  (%) = 398 (M+H <sup>81</sup>Br, 100), 396 (M+H <sup>79</sup>Br, 96).

15 <sup>1</sup>H-NMR (MeOH d<sub>4</sub>):  $\delta$  = 3.81 (3H, s, NCH<sub>3</sub>), 7.12 (1H, m, ArH), 7.46-7.57 (3H, m, ArH), 7.62-7.69 (5H, m, ArH).

[0356] HPLC: retention time 3.12 min.

### Experiment 13.37

#### Preparation and Analysis of Compound 30

20 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(2-cyanophenyl)carboxamide

[0357] (Protocol B) – 2-aminobenzonitrile;  
colorless solid (EtOAc/hexane).

MS (ES<sup>+</sup>):  $m/z$  (%) = 398 (M+H <sup>81</sup>Br, 95), 396 (M+H <sup>79</sup>Br, 100).

25 <sup>1</sup>H-NMR (CDCl<sub>3</sub>):  $\delta$  = 3.79 (3H, s, CH<sub>3</sub>), 7.13-7.28 (2H, m, ArH), 7.49 (1H, t, J=7.8, ArH), 7.57 (1H, m, ArH), 7.62 (1H, m, ArH), 7.65-7.71 (2H, m, ArH), 7.78 (1H, m, ArH), 8.07 (1H, d, J=8.6, ArH), 8.83 (1H, s, NH), 9.62 (1H, s, NH).

[0358] HPLC: retention time 3.05 min (Method A).

### Experiment 13.38

#### 30 Preparation and Analysis of Compound 33

((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(4-fluorophenylmethyl)carboxamide

-140-

[0359] (Protocol B) – 4-fluorobenzylamine;  
colorless solid, m.p. 185.5-186.6°C (EtOAc/hexane).  
MS (ES+):  $m/z$  (%) = 405 (M+H  $^{81}\text{Br}$ , 97), 403 (M+H  $^{79}\text{Br}$ , 100).  
 $^1\text{H}$ -NMR (DMSO  $d_6$ ):  $\delta$  = 3.75 (3H, s, CH<sub>3</sub>), 4.28 (2H, d, J=6.0, CH<sub>2</sub>), 6.73 (1H, t, J=5.9, NH), 7.01 (1H, d, J=7.5, ArH), 7.10-7.18 (2H, m, ArH), 7.27-7.41 (4H, m, ArH), 7.56 (1H, s, ArH), 7.62 (1H, s, ArH), 8.82 (1H, s, NH).

[0360] HPLC: retention time 3.10 min (Method A).

[0361] TLC: retention factor 0.25 (50% EtOAc/hexane).

### 10 Experiment 13.39

#### Preparation and Analysis of Compound 34

((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(3,4-dimethoxyphenylmethyl)carboxamide

[0362] (Protocol B) – 3,4-dimethoxybenzylamine:  
colorless solid, m.p. 174.9-175.5°C (EtOAc/hexane).  
MS (CI+):  $m/z$  (%) = 447 (M+H  $^{81}\text{Br}$ , 100), 445 (M+H  $^{79}\text{Br}$ , 92).  
 $^1\text{H}$ -NMR (DMSO  $d_6$ ):  $\delta$  = 3.71 (3H, s, CH<sub>3</sub>), 3.73 (3H, s, CH<sub>3</sub>), 3.76 (3H, s, CH<sub>3</sub>), 4.22 (2H, d, J=5.8, CH<sub>2</sub>), 6.62 (1H, t, J=5.7, NH), 6.80 (1H, m, ArH), 6.89 (2H, m, ArH), 6.98 (1H, m, ArH), 7.36-7.51 (3H, m, ArH), 7.63 (1H, s, ArH), 8.76 (1H, s, NH).

[0363] HPLC: retention time 2.86 min (Method A).

[0364] TLC: retention factor 0.20 (50% EtOAc/hexane).

### Experiment 13.40

#### Preparation and Analysis of Compound 35

25 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(3,4,5-trimethoxyphenylmethyl)carboxamide

[0365] (Protocol B) – 3,4,5-trimethoxybenzylamine;  
colorless solid (EtOAc/hexane).  
MS (CI+):  $m/z$  (%) = 477 (M+H  $^{81}\text{Br}$ , 100), 475 (M+H  $^{79}\text{Br}$ , 95).

-141-

<sup>1</sup>H-NMR (DMSO d<sub>6</sub>): δ = 3.63 (3H, s, OCH<sub>3</sub>), 3.75 (9H, s, 3xCH<sub>3</sub>), 4.21 (1H, d, J=5.9, CH<sub>2</sub>), 6.61 (2H, s, ArH), 6.65 (1H, t, J=5.9, NH), 6.99 (1H, m, ArH), 7.40 (1H, t, J=7.7, ArH), 7.45 (1H, m, ArH), 7.56 (1H, m, ArH), 7.64 (1H, s, ArH), 8.77 (1H, s, NH).

[0366] HPLC: retention time 5.91 min (Method B).

5 [0367] TLC: retention factor 0.50 (50% EtOAc/hexane).

### Experiment 13.41

#### Preparation and Analysis of Compound 36

N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)-(((2-methylphenyl)methyl)amino)carboxamide

10 [0368] (Protocol B) – 2-methylbenzylamine;  
colorless solid (EtOAc/hexane).  
MS (CI<sup>+</sup>): *m/z* (%) = 401 (M+H <sup>81</sup>Br, 96), 399 (M+H <sup>79</sup>Br, 100).  
<sup>1</sup>H-NMR (DMSO d<sub>6</sub>): δ = 2.28 (3H, s, CH<sub>3</sub>), 3.76 (3H, s, NCH<sub>3</sub>), 4.28 (1H, d, J=5.8, CH<sub>2</sub>), 6.60 (1H, t, J=5.8, NH), 7.01 (1H, m, ArH), 7.15 (3H, m, ArH), 7.24 (1H, m, ArH),  
15 7.38-7.50 (2H, m, ArH), 7.57 (1H, m, ArH), 7.65 (1H, s, ArH), 8.77 (1H, s, NH).

[0369] HPLC: retention time 2.74 min (Method A).

[0370] TLC: retention factor 0.20 (50% EtOAc/hexane).

### Experiment 13.42

#### 20 Preparation and Analysis of Compound 37

((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(4-methoxyphenylmethyl)carboxamide

[0371] (Protocol B) – 4-methoxybenzylamine;  
colorless solid (EtOAc/hexane).  
MS (CI<sup>+</sup>): *m/z* (%) = 417 (M+H <sup>81</sup>Br, 94), 415 (M+H <sup>79</sup>Br, 100).  
25 <sup>1</sup>H-NMR (DMSO d<sub>6</sub>): δ = 3.72 (3H, s, CH<sub>3</sub>), 3.77 (3H, s, NCH<sub>3</sub>), 4.22 (1H, d, J=5.9, CH<sub>2</sub>), 6.62 (1H, t, J=5.9, NH), 6.90 (2H, d, J=8.8, ArH), 7.00 (1H, m, ArH), 7.23 (2H, d, J=8.8, ArH), 7.39 (1H, t, J=7.8, ArH), 7.43 (1H, m, ArH), 7.56 (1H, m, ArH), 7.64 (1H, s, ArH), 8.73 (1H, s, NH).

[0372] HPLC: retention time 6.41 min (Method B).

30 [0373] TLC: retention factor 0.25 (50% EtOAc/hexane).

**Experiment 13.43****Preparation and Analysis of Compound 38**

((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(2-(4-methoxy)phenylethyl)carboxamide

- 5    **[0374]**        (Protocol B) – 2-(4-methoxyphenyl)ethylamine;  
                     colorless solid (EtOAc/hexane).  
                     MS (ES<sup>+</sup>): *m/z* (%) = 431 (M+H <sup>81</sup>Br, 95), 429 (M+H <sup>79</sup>Br, 100).  
                     <sup>1</sup>H-NMR (DMSO *d*<sub>6</sub>): δ = 2.68 (2H, t, J=7.1, CH<sub>2</sub>), 3.31 (2H, m, CH<sub>2</sub>), 3.71 (3H, s,  
                     CH<sub>3</sub>), 3.77 (3H, s, CH<sub>3</sub>), 6.16 (1H, t, J=5.8, NH), 6.87 (2H, d, J=8.6, ArH), 6.99 (1H, dt,  
10                J=1.4, 7.3, ArH), 7.16 (2H, d, J=8.6, ArH), 7.33-7.48 (2H, m, ArH), 7.52 (1H, m, ArH), 7.63  
                     (1H, s, ArH), 8.71 (1H, s, NH).

**[0375]**            HPLC: retention time 6.62 min (Method B).

15    **EXAMPLE 14****Experiments 14.1 – 14.19****General Synthetic Strategies, Preparation and Analysis of Compounds**

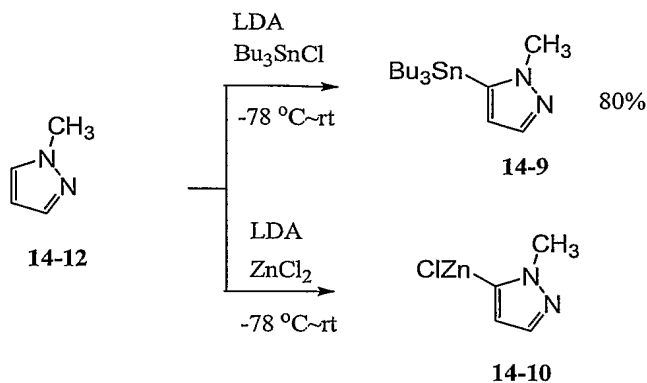
- [0376]**            Compounds of certain embodiments of the invention were prepared according to the  
                     procedures below.

20

**General Synthetic Strategies**

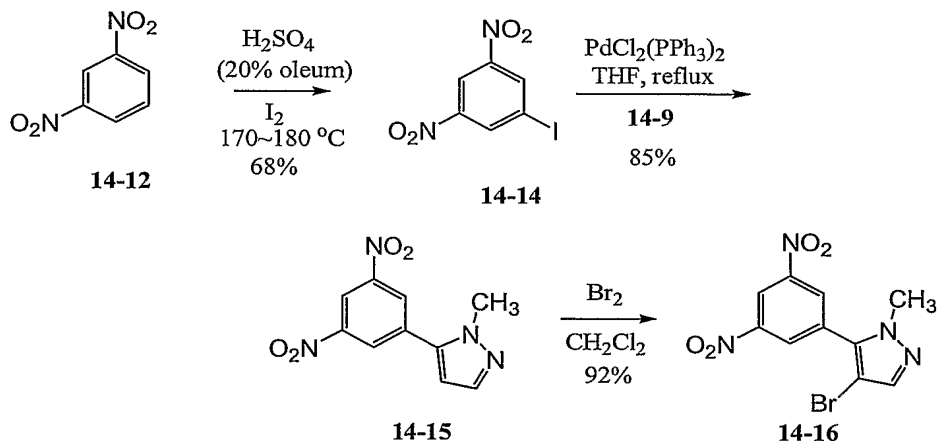
- [0377]**            Tributyltin pyrazole **14-9** was synthesized from pyrazole **14-12** in 80 % chemical  
                     yield. Pyrazole **14-12** was directly lithiated with LDA at –78 °C followed by quenching with  
                     Bu<sub>3</sub>SnCl. Tributyltin pyrazole **14-9** is fairly stable on silica gel and can be stored at room temperature  
25                without any decomposition for up to one month in the air. Zinc pyraole **14-10** was also formed under  
                     lithiation with LDA or *n*-BuLi at –78 °C followed by quenching with ZnCl<sub>2</sub> in high yields. Zinc  
                     pyraole **14-10** was freshly synthesized for coupling reactions (Scheme **14-1**).

-143-



Scheme 14-1

[0378] 1,3-Dinitrobenzene **14-13** was commercially available and iodinated with  $\text{I}_2$  and  $\text{H}_2\text{SO}_4$  (oleum) to afford iodobenzene **14-14** in 68 % yield. Iodobenzene **14-14** was coupled with tributyltin pyrazole **14-9** under 7 %  $\text{PdCl}_2(\text{PPh}_3)_2$  to afford coupled product **14-15** in 85 % yield which could also be separable by recrystallization in ethanol and synthesize in quantity (i.e., 20g scale). Regiospecific bromination of **14-16** occurred smoothly under  $\text{Br}_2$  in dichloromethane at room temperature (Scheme 14-2).



Scheme 14-2

10

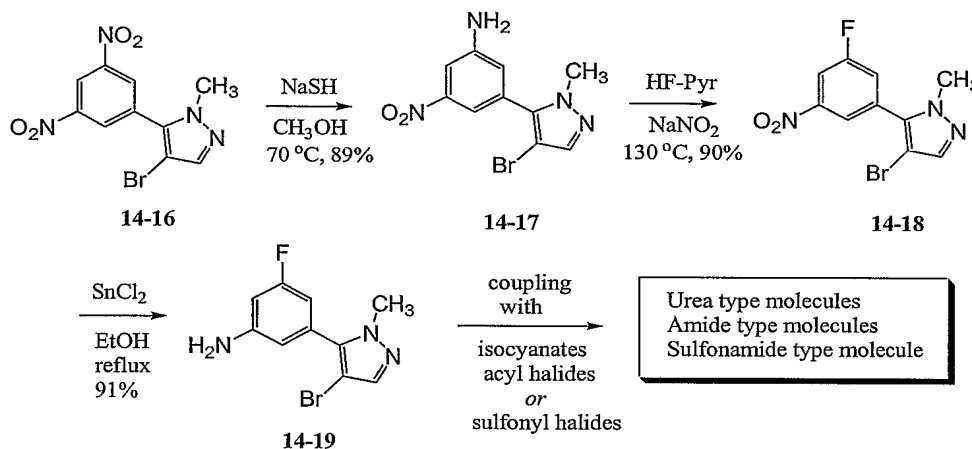
[0379] A number of reagents have been used for selective reduction of nitroaromatic compounds, the most common being alcoholic basic hydrogen sulfide, alcoholic ammonium sulphide, and alcoholic sodium polysulphide. However, the product amines from these reactions are generally obtained in low yields and are often difficult to purify. The hydrosulfide-induced reaction was investigated intensively by Idoux and is superior to the previously reported method. Based on this

15

-144-

result, dinitro **14-16** was reduced to aniline **14-17** with NaSH in CH<sub>3</sub>OH; 2.7 equivalents of NaSH were needed to complete the reaction. Double reduced compound was also detected on the LCMS, but it was less than 5 % (Scheme **14-3**).

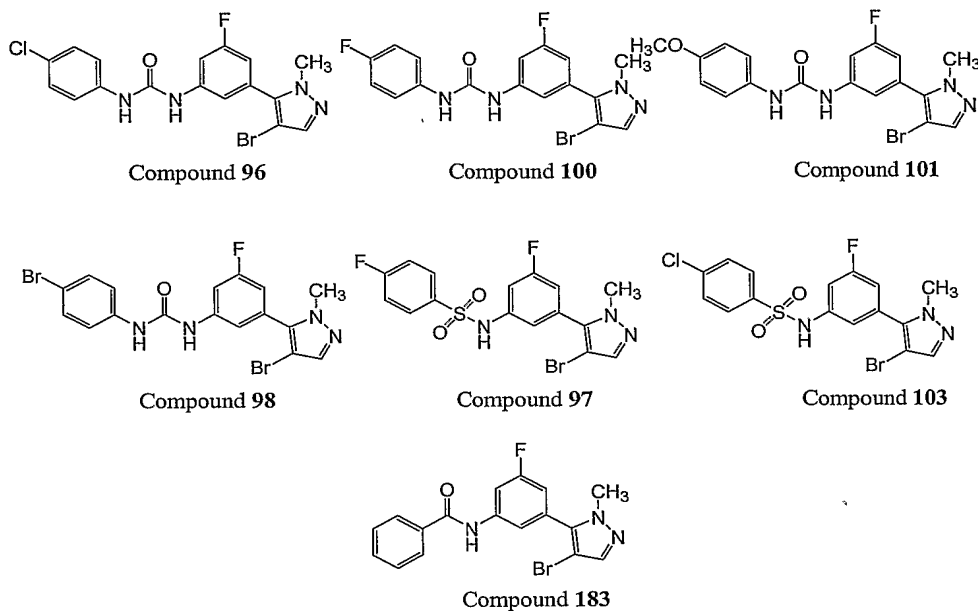
**[0380]** Aniline **14-17** was also fluorinated under HF•Pyr and NaNO<sub>2</sub> to furnish **14-18** in 90 % yield. **14-18** could be reduced with SnCl<sub>2</sub> as a usual way to form flouroaniline **14-19** in 91 % yield. The precursor **14-19** was coupled with various isocyanates, acyl halides and sulfonyl halides to form urea, amide and sulfonamide type molecules respectively in good yields (Scheme **14-3**).

Scheme **14-3**

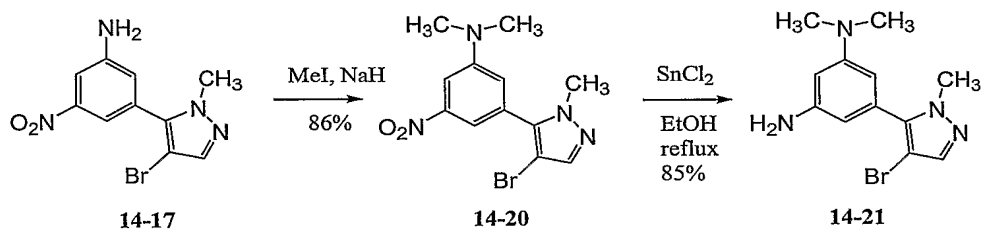
10 **[0381]** The following contains the list of representative fluorinated compounds synthesized (TABLE **14-1**).

-145-

Table 14-1 Compounds of the invention containing a fluoride functionality.



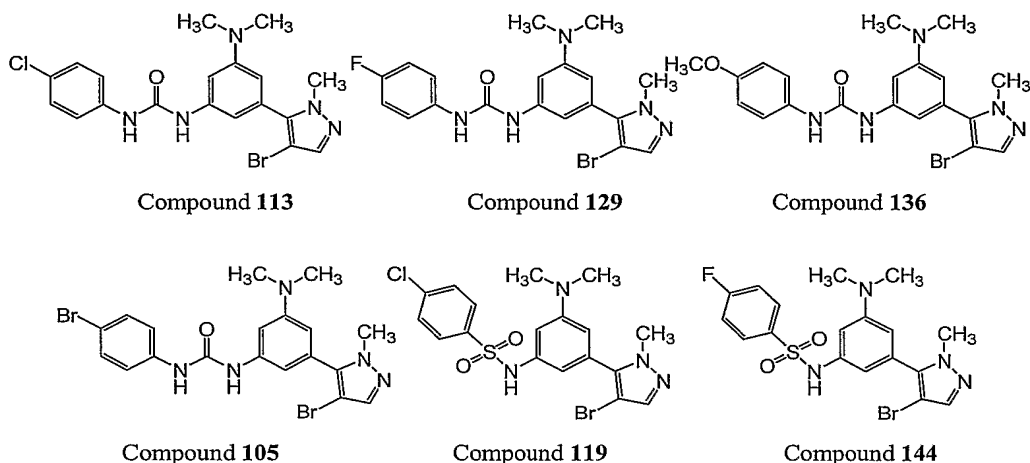
[0382] In addition, as shown in Scheme 14-3, aniline 14-17 was also alkylated with 2 equivalents of  $\text{CH}_3\text{I}$  and  $\text{NaH}$  at room temperature in 86 % yield. Finally, 14-17 was reduced with  $\text{SnCl}_2 \cdot \text{H}_2\text{O}$  in  $\text{EtOH}$  at a reflux condition to furnish the aminomethylated precursor 14-21 in 85 % yield (Scheme 14-4).



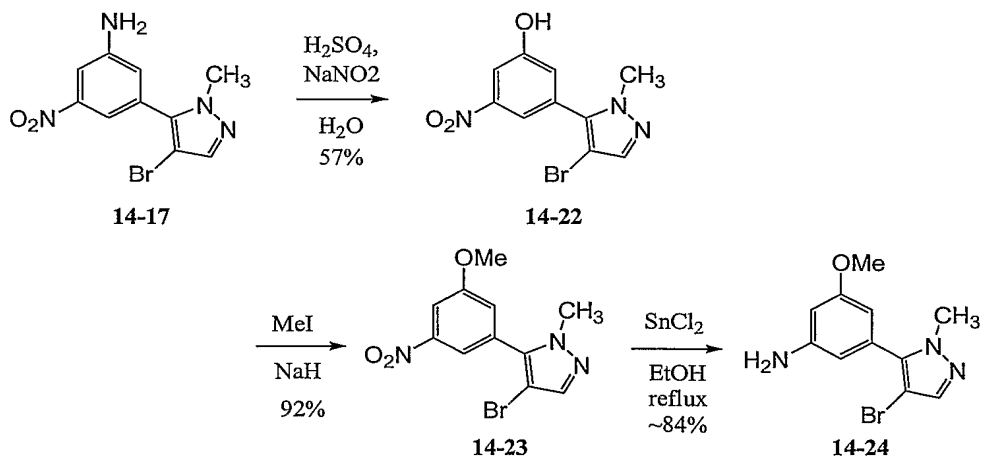
Scheme 14-4

[0383] Aniline 14-21 was coupled with various isocyanates, acyl chlorides and sulfonyl chlorides to form aminodimethylated compound of the invention in high yields (TABLE 14-2).

-146-

Table 14-2 Compounds of the invention containing *N,N*-dimethylamino functionality.

[0384] The amino group on aniline 14-17 was transformed into a hydroxy group under  $\text{H}_2\text{SO}_4$  and  $\text{NaNO}_2$  to give phenol 14-22 in a 57 % yield. Phenol 14-22 was methylated with MeI and NaH in DMF followed by reduction with  $\text{SnCl}_2 \cdot \text{H}_2\text{O}$  in EtOH providing aniline 14-24 in good yields (Scheme 14-5).



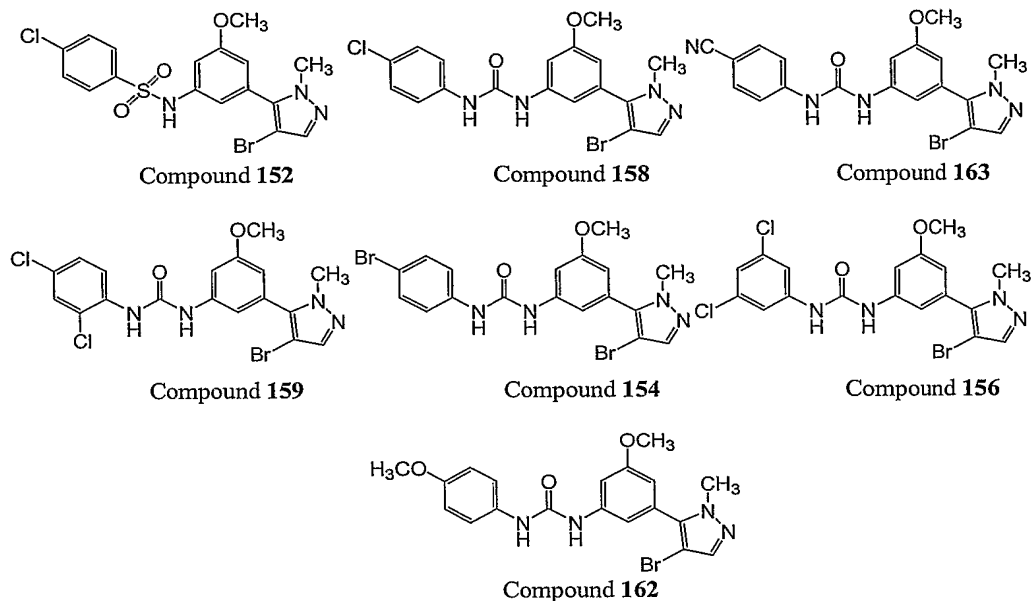
Scheme 14-5

10 [0385] Aniline 14-24 was coupled with various isocyanates, acyl chlorides and sulfonyl chlorides to furnish the compounds of the invention containing a methoxy group (TABLE 14-3).

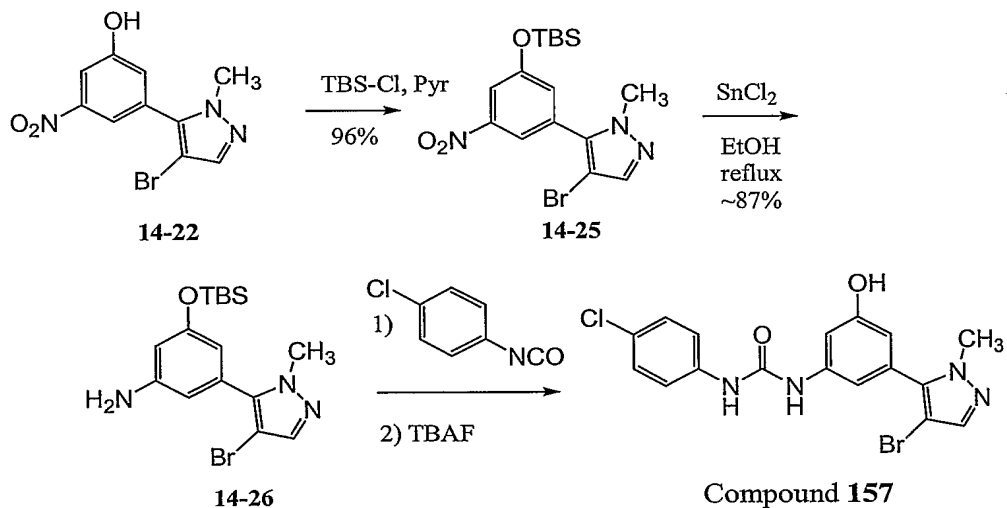


-147-

Table 14-3 Compounds of the invention containing methoxy functionality.



[0386] An introduction of a hydroxy group on the aromatic ring was also attempted. Phenol **14-22** was protected with TBS-Cl in pyridine at room temperature followed by reduction with  $\text{SnCl}_2 \cdot \text{H}_2\text{O}$  in EtOH to afford silyl ether **14-25** in high yield. After reduction with  $\text{SnCl}_2$ , aniline **14-26** was coupled with 4-chlorophenyl isocyanate at room temperature and deprotected with TBAF *in situ* to furnish Compound **157** of the invention in 89 % yield after column chromatography on silica gel (Scheme 14-6).

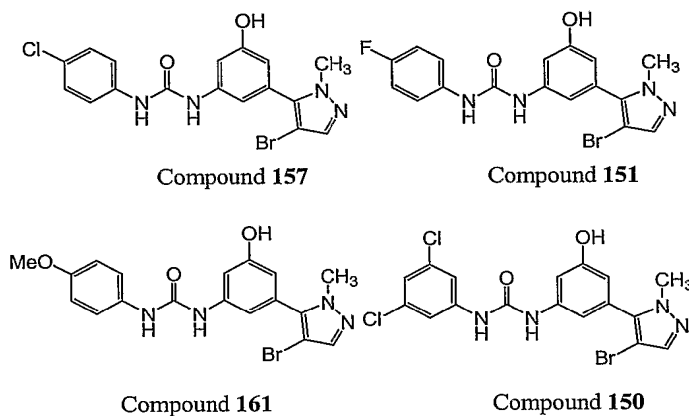


Scheme 14-6

-148-

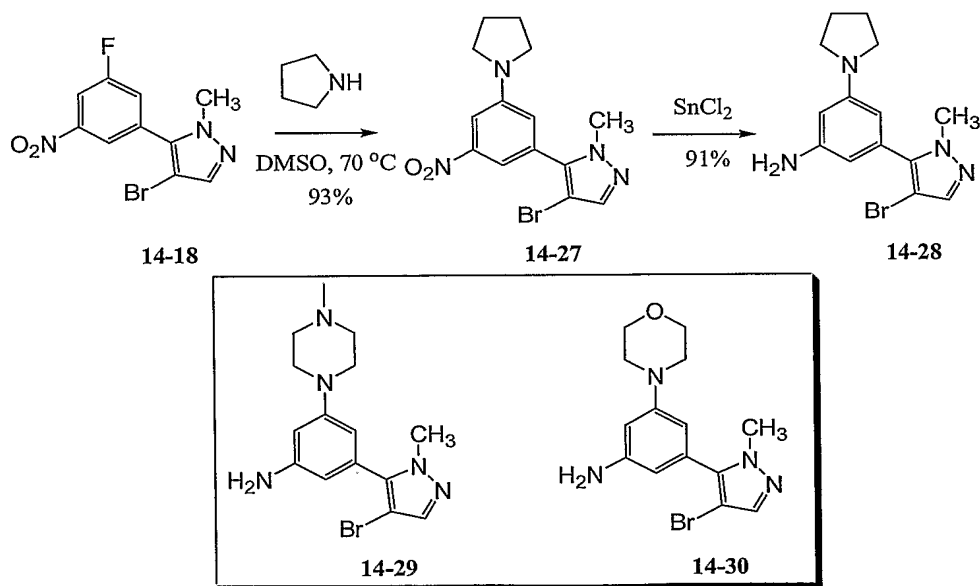
[0387] The list of compounds of the invention containing a hydroxy functionality is shown below (TABLE 14-4).

Table 14-4 Compounds of the invention containing hydroxy functionality



5

[0388] Several attempts for introduction of cycloamines on the aromatic group have been made. The direct substitution reaction of various cyclic amines under mild conditions gave desired products. For these reactions, DMSO is the choice of solvents (Scheme 14-7).



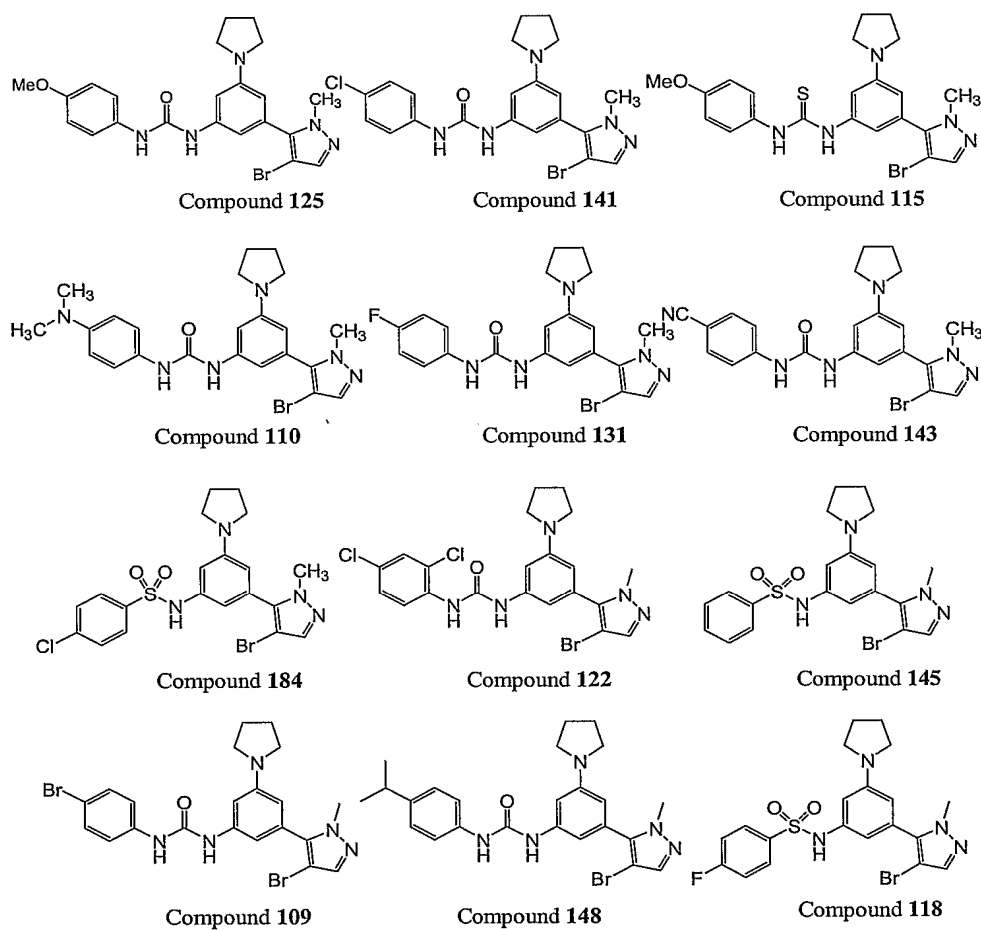
Scheme 14-7

10

-149-

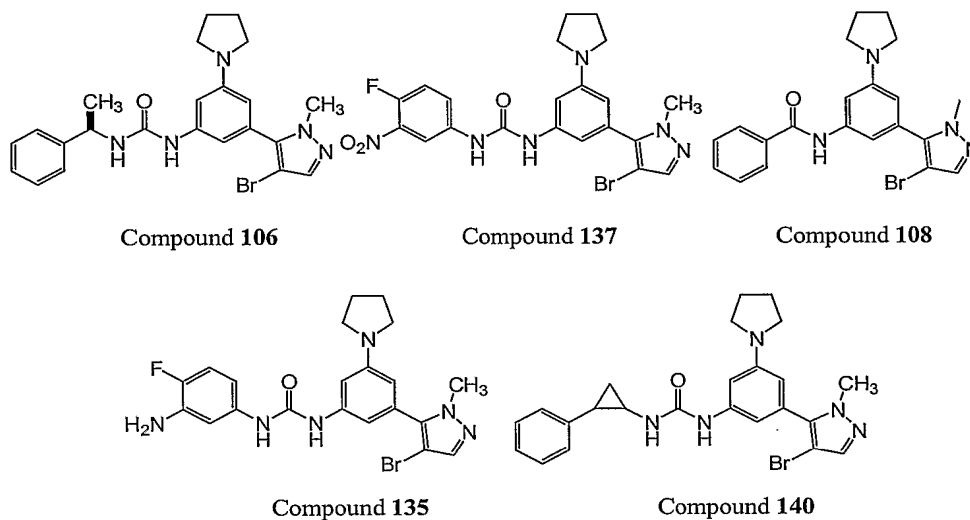
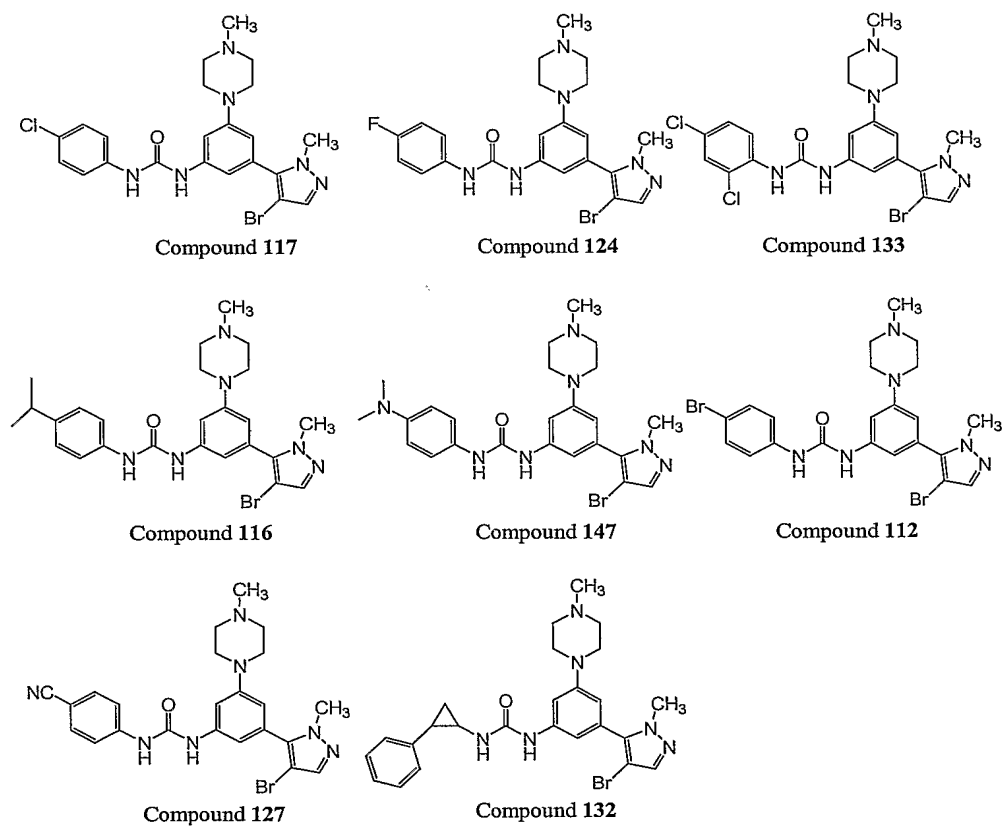
[0389] Fluoro phenyl **14-18** was treated with pyrrolidine in DMSO to afford **14-27** in 93% yield. Subsequently, pyrrolidine **14-27** was reduced with four equivalents of  $\text{SnCl}_2 \cdot 2\text{H}_2\text{O}$  in EtOH to furnish the precursor **14-28** in 91 % yield. *N*-Methyl piperazine and morpholine were introduced to the aromatic group in the same manner to achieve the precursors **14-29** and **14-30** respectively. With these precursors available, the coupling reactions were completed with various isocyanates, acyl chlorides and sulfonyl chlorides. TABLES 14-5, 14-6 and 14-7 show additional compounds of the invention.

Table 14-5 Compounds of the invention containing pyrrolidine functionality.



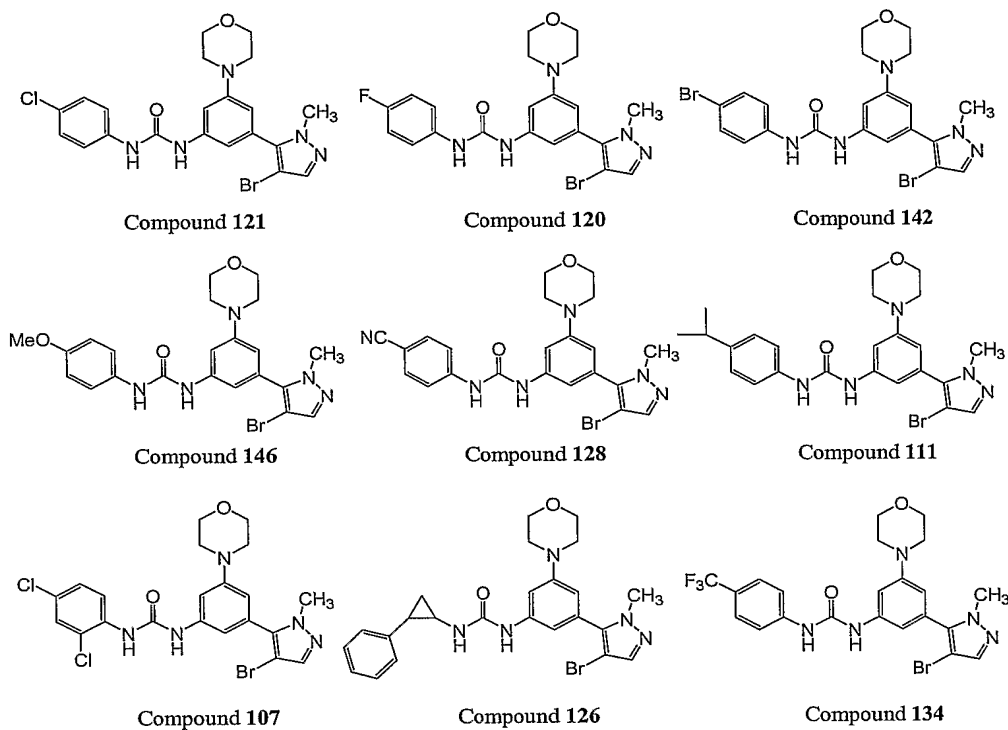
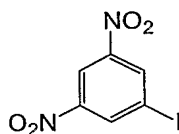
-150-

Table 14-5 Continued

Table 14-6 Compounds of the invention containing *N*-methyl piperazine functionality.

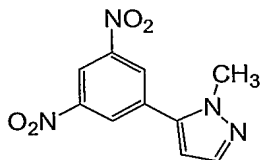
-151-

Table 14-7 Compounds of the invention containing morpholine functionality.

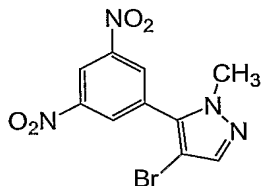
**Experiment 14.1****5 Preparation and Analysis of Compound**1,3-Dinitro iodobenzene **14-14**:

**[0390]** 1,3-Dinitrobenzene (10 g, 59.5 mmol) and  $I_2$  (7.5 g, 29.5 mmol) were dissolved in 20% oleum (75.9 g) and heated to 170 °C for 45 min. The reaction mixture was maintained at 170~180 °C for 1hr. The temperature was lowered to room temperature. The mixture was poured into crushed ice (500 g) and stirred for 2 hrs. The solid material was filtered and washed with  $H_2O$  (500 mL). The solid was dissolved in EtOAc (250 mL) and washed with  $H_2O$  (150 mL x 2). The EtOAc was dried over  $MgSO_4$  and concentrated under vacuum to afford the desired product **14-14** in 62 % yield (10.8 g).  $R_f$  = 0.52 (EtOAc/Hex = 1/4).

-152-

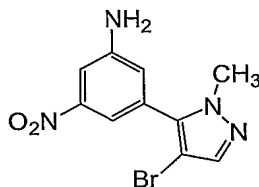
**Experiment 14.2****Preparation and Analysis of Compound****Pyrazole 14-15**

- 5 [0391] Iodobenzen 14-14 (2 g, 6.8 mmol) was dissolved in anhydrous THF (20 mL) and treated with tributyltin pyrazole 14-9 (2.5 g, 6.8 mmol, see Scheme 14-1) and  $\text{PdCl}_2(\text{PPh}_3)_2$  (0.48 g, 0.68 mmol). The mixture was heated to reflux. After refluxing for 12hrs, the reaction mixture was cooled to room temperature and concentrated under vacuum. The residue was dissolved in EtOAc (50 mL) and washed with  $\text{H}_2\text{O}$  (50 mL x 2). The EtOAc was dried over  $\text{MgSO}_4$  and concentrated under vacuum. The crude compound was recrystallized in EtOH (30 mL) to afford the desired coupled product 14-15 (1.41 g, 84 %).  $R_f = 0.5$  (EtOAc/Hex = 1/3).
- 10

**Experiment 14.3****Preparation and Analysis of Compound****15 Bromo pyrazole 14-16**

- [0392] To a solution of 14-15 (0.4 g, 1.6 mmol) in dichloromethane (5 mL), was added dropwise  $\text{Br}_2$  (91  $\mu\text{L}$ , 1.77 mmol) in dichloromethane (1 mL) for 5 min at 0 °C. After addition of  $\text{Br}_2$ , the reaction mixture was warmed to room temperature and stirred for 2 hrs. The reaction mixture was washed with  $\text{H}_2\text{O}$  (10 mL) and triturated with EtOH to afford yellowish crystals of the desired product (0.46 g, 92 %)  $R_f = 0.72$  (EtOAc/Hex = 1/2).
- 20

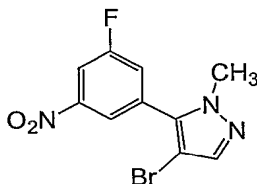
-153-

**Experiment 14.4****Preparation and Analysis of Compound****Aniline 14-17**

- 5 [0393] Dinitrophenyl **14-16** (0.6 g, 1.8 mmol) was dissolved in MeOH (40 mL) and toluene (10 mL) and heated to refluxing. NaSH (262 mg, 4.68 mmol) in MeOH (10 mL) was added into the solution for 45 min. The reaction mixture was stirred for 30 min at the same temperature and cooled to room temperature. The reaction mixture was concentrated under vacuum and dissolved in EtOAc (20 mL). The EtOAc was washed with H<sub>2</sub>O (20 mL x 2) and dried over MgSO<sub>4</sub>. The crude product
- 10 was purified over column chromatography ( $R_f$  = 0.51, EtOAc/Hex = 1/1) to afford to a yellow solid as the desired product **14-17** (487 mg, 91 %).

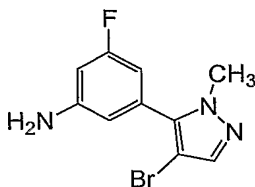
**Experiment 14.5****Preparation and Analysis of Compound**

- 15 Fluorophenyl pyrazole **14-18**

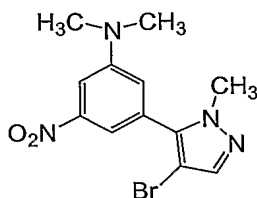


- [0394] Aniline **14-17** (0.3 g, 1.01 mmol) was added into HF•Pyr (2.6 mL) at 0 °C and warmed to room temperature. After stirring for 30 min, the solution was cooled to -30 °C and NaNO<sub>2</sub>
- 20 (77 mg, 1.11 mmol) added portionwise for 10 min. The reaction mixture was maintained at -30 °C for 30 min. The mixture was then heated to 145 °C and stirred for 10 min. The reaction mixture was cooled to room temperature and quenched with crushed ice (10 mL). The crude product was extracted with EtOAc (20 mL), dried over MgSO<sub>4</sub> and concentrated under vacuum. The crude material was purified by column chromatograph (EtOAc/Hex = 1/1,  $R_f$  = 0.85) to afford a yellow crystal as desired
- 25 product **14-17** (275 mg, 91%).

-154-

**Experiment 14.6****Preparation and Analysis of Compound**Fluoro aniline **14-19**

- 5    **[0395]**    A 5 mL round-bottom flask was charged with 100 mg of **14-18** (0.33 mmol) and  $\text{SnCl}_2 \cdot 2\text{H}_2\text{O}$  (0.3 g, 1.33 mmol) and dissolved in EtOH (3 mL). The mixture was refluxed for 1.5 hrs and cooled to room temperature. The reaction was concentrated under vacuum and extracted with EtOAc (20 mL x 2) and  $\text{H}_2\text{O}$  (20 mL). The EtOAc was dried over  $\text{MgSO}_4$ , concentrated under vacuum and purified over silica gel (EtOAc/Hex = 1/1,  $R_f$  = 0.41) to afford a white crystal of the
- 10    desired product **14-19** (79 mg, 89%).

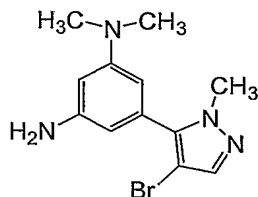
**Experiment 14.7****Preparation and Analysis of Compound**Dimethyl aniline **14-20**

15

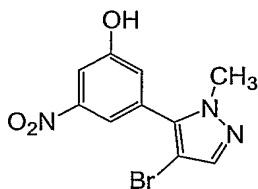
- [0396]**    Aniline **14-17** (1.0 g, 3.36 mmol) was dissolved in DMF (5 mL) in a 10 mL round-bottom flask. The solution was cooled to 0 °C and treated with 60 % NaH (404 mg, 10.08 mmol). The reaction mixture was maintained at the same temperature for 30 min and warmed to room temperature. The mixture was quenched with 100  $\mu\text{L}$  of EtOH and extracted with EtOAc (20 mL).
- 20    The EtOAc was dried over  $\text{MgSO}_4$  and concentrated under vacuum. The residue was purified over silica gel (EA/Hex = 1/1,  $R_f$  = 0.81) to afford yellow solids as the desired product **14-20** (858 mg, 86%).



-155-

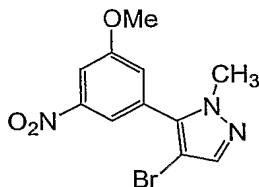
**Experiment 14.8****Preparation and Analysis of Compound****Aniline 14-21**

- 5    **[0397]**    A 5 mL round-bottom flask was charged with 103 mg of **14-20** (0.33 mmol) and  $\text{SnCl}_2 \cdot 2\text{H}_2\text{O}$  (0.3 g, 1.33 mmol) and dissolved in EtOH (3 mL). The mixture was refluxed for 1.5 hrs and cooled to room temperature. The reaction was under concentrated under vaccum and extracted with EtOAc (20 mL x 2) and  $\text{H}_2\text{O}$  (20 mL). The EtOAc was dried over  $\text{MgSO}_4$ , concentrated under vaccum and purified over silica gel (EtOAc/Hex = 1/1,  $R_f$  = 0.41) to afford a white crystal as desired
- 10    product **14-21** (82 mg, 85%).

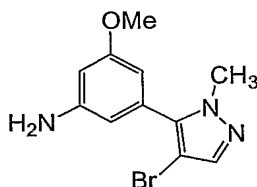
**Experiment 14.9****Preparation and Analysis of Compound****Phenol 14-22**

- 15
- [0398]**    Aniline **14-17** (2 g, 6.73 mmol) was dissolved in  $\text{H}_2\text{SO}_4$  (5 mL) and  $\text{H}_2\text{O}$  (5 mL) at 0 °C. The mixture was warmed to room temperature and stirred for 30 min. The solution was treated with  $\text{NaNO}_2$  (557 mg, 808 mmol) at -30 °C and stirred for 1 hr. The reaction mixture was heated to 100 °C and stirred for 1 hr. The resulting mixture was cooled to room temperature and quenched with crushed ice (10 g). The mixture was extracted with EtOAc (20 mL x 2). The EtOAc was dried over  $\text{MgSO}_4$  and concentrated under vaccum. The residue was purified over silica gel (EtOAc/Hex = 1/1,  $R_f$  = 0.52) to afford the white crystals of desired product **14-22** (1.13 g, 57%).
- 20

-156-

**Experiment 14.10****Preparation and Analysis of Compound****Anisole 14-23**

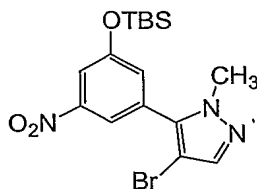
- 5    **[0399]**        To a cooled solution of phenol **14-22** (657 mg, 2.2 mmol) in DMF (5 mL) was treated with 60 % NaH (106 mg, 2.65 mmol). The resulting mixture was stirred at 0 °C and treated with CH<sub>3</sub>I (165 μL, 2.65 mmol). The reaction mixture was stirred for 1 hr and warmed to room temperature. The mixture was poured into H<sub>2</sub>O (10 mL) and extracted with EtOAc (10 mL x 2). The EtOAc was dried over MgSO<sub>4</sub> and concentrated under vacuum. The residue was purified over silica
- 10   gel (EtOAc/Hex = 1/1, R<sub>f</sub> = 0.75) to afford desired anisole **14-23** (629 mg, 92%).

**Experiment 14.11****Preparation and Analysis of Compound****Aniline 14-24**

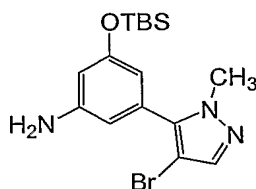
15

- [0400]**        A 25 mL round-bottom flask was charged with 103 mg of anisole **14-23** (2.08 mmol) and SnCl<sub>2</sub>·2H<sub>2</sub>O (2.13 g, 8.36 mmol) and dissolved in EtOH (10 mL). The mixture was refluxed for 1.5 hrs and cooled to room temperature. The reaction was concentrated under vacuum and extracted with EtOAc (30 mL x 2) and H<sub>2</sub>O (30 mL). The EtOAc was dried over MgSO<sub>4</sub>, concentrated under
- 20   vacuum and purified over silica gel (EtOAc/Hex = 1/1, R<sub>f</sub> = 0.41) to afford a white crystal of desired product **14-24** (489 mg, 84 %).

-157-

**Experiment 14.12****Preparation and Analysis of Compound****Silyl ether 14-25**

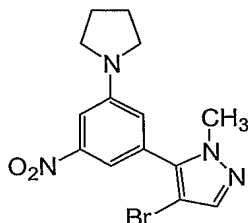
- 5    **[0401]**        To a solution of phenol **14-22** (1g, 3.38 mmol) dissolved in pyridine (3 mL) was added TBS-Cl (611 mg, 4.05 mmol) and the resulting solution was allowed to stir for 10 hrs. The reaction mixture was poured into H<sub>2</sub>O (20 mL) and extracted with EtOAc (20 mL x 2). The EtOAc was washed with 1.0 N HCl (10 mL) dried over MgSO<sub>4</sub> and concentrated under vacuum to afford crude product **14-25** (1.36 g, 96%). The crude product was used for the next step without further
- 10   purification (EtOAc/Hex = 1/1, R<sub>f</sub> = 0.89).

**Experiment 14.13****Preparation and Analysis of Compound****Aniline 14-26**

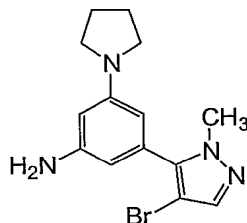
15

- [0402]**        A 25 mL round-bottom flask was charged with 1.0 g of **14-25** (2.4 mmol) and SnCl<sub>2</sub>·2H<sub>2</sub>O (2.19 g, 9.7 mmol) and dissolved in EtOH (10 mL). The mixture was refluxed for 1.5 hrs and cooled to room temperature. The reaction was concentrated under vacuum and extracted with EtOAc (30 mL x 2) and H<sub>2</sub>O (30 mL). The EtOAc was dried over MgSO<sub>4</sub>, concentrated under
- 20   vacuum and purified over silica gel (EtOAc/Hex = 1/1, R<sub>f</sub> = 0.41) to afford a white crystal of desired product **14-26** (798 mg, 87 %).

-158-

**Experiment 14.14****Preparation and Analysis of Compound****Pyrrolidine 14-27**

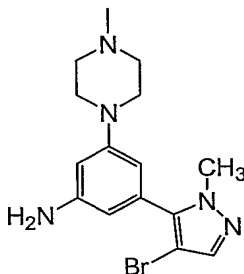
- 5    [0403]            Fluorophenyl pyrazole **14-18** (2.6 g, 8.67 mmol) was directly weighed into a 50 mL round-bottom flask and dissolved in DMSO (10 mL). The solution was treated with pyrrolidine (2.2 mL, 26 mmol) and heated to 80 °C. After stirring for 2 hrs, the reaction was poured into H<sub>2</sub>O (50 mL) and extracted with EtOAc (20 mL x 2). The EtOAc was washed with 1.0 N HCl (10 mL), dried over MgSO<sub>4</sub> and concentrated under vacuum. The residue was purified over silica gel to afford the desired product **14-27** (2.77 g, 93%).
- 10

**Experiment 14.15****Preparation and Analysis of Compound****Aniline 14-28**

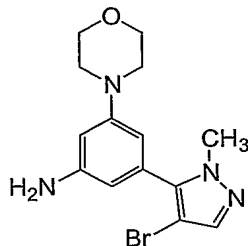
15

- 20    [0404]            A 50 mL round-bottom flask was charged with 2.0 of Pyrrolidine **14-27** (5.7 mmol) and SnCl<sub>2</sub>·2H<sub>2</sub>O (5.8 g, 22.8 mmol) charged dissolved in EtOH (30 mL). The mixture was refluxed for 1.5 hrs and cooled to room temperature. The reaction was concentrated under vacuum and extracted with EtOAc (50 mL x 2) and H<sub>2</sub>O (50 mL). The EtOAc was dried over MgSO<sub>4</sub>, concentrated under vacuum and purified over silica gel (EtOAc/Hex = 1/1, R<sub>f</sub> = 0.41) to afford a white crystal of desire product **14-28** (1.66 g, 91 %):.

-159-

**Experiment 14.16****Preparation and Analysis of Compound****N-Methylpiperazine 14-29**

- 5 [0405] Fluorophenyl pyrazole **14-18** (2.6 g, 8.67 mmol) was directly weighed into a 50 mL round-bottom flask and dissolved in DMSO (10 mL). The solution was treated with 4-methylpiperazine (1.5 mL, 17.3 mmol) and heated to 80 °C. After stirring for 2 hrs, the reaction was poured into H<sub>2</sub>O (50 mL) and extracted with EtOAc (20 mL x 2). The EtOAc was washed with 1.0 N HCl (10 mL), dried over MgSO<sub>4</sub> and concentrated under vacuum. The crude product was used for the
- 10 next step without further purification. A 100 mL round-bottom flask was charged with the crude compound and SnCl<sub>2</sub>·2H<sub>2</sub>O (8.86 g, 34.7 mmol) and dissolved in EtOH (70 mL). The mixture was refluxed for 1.5 hrs and cooled to room temperature. The reaction was concentrated under vacuum and extracted with EtOAc (50 mL x 2) and H<sub>2</sub>O (50 mL). The EtOAc was dried over MgSO<sub>4</sub>, concentrated under vacuum and purified over silica gel EtOAc (Hex = 1/1, R<sub>f</sub> = 0.38) to afford a white
- 15 crystal of desired product **14-29** (2.12 g, 69.7 % in 2 steps).

**Experiment 14.17****Preparation and Analysis of Compound****Morpholine 14-30**

20

- [0406] Fluorophenyl pyrazole **14-18** (509 mg, 1.69 mmol) was directly weighed into a 5 mL round-bottom flask and dissolved in DMSO (3 mL). The solution was treated with morpholine (295 µL, 3.38 mmol) and heated to 80 °C. After stirring for 2 hrs, the reaction was poured into H<sub>2</sub>O (10 mL) and extracted with EtOAc (10 mL x 2). The EtOAc was washed with 1.0 N HCl (5 mL), dried

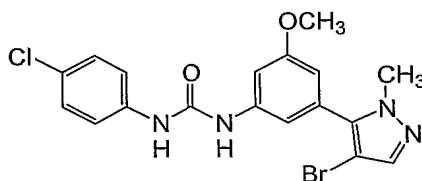
-160-

over  $\text{MgSO}_4$  and concentrated under vacuum. The crude product was used for the next step without further purification. A 25 mL round-bottom flask was charged with the crude compound and  $\text{SnCl}_2 \cdot 2\text{H}_2\text{O}$  (1.72 g, 6.79 mmol) and dissolved in EtOH (20 mL). The mixture was refluxed for 1.5 hrs and cooled to room temperature. The reaction was concentrated under vacuum and extracted with EtOAc (10 mL x 2) and  $\text{H}_2\text{O}$  (10 mL). The EtOAc was dried over  $\text{MgSO}_4$ , concentrated under vacuum and purified over silica gel (EtOAc/Hex = 1/1,  $R_f$  = 0.45) to afford a white crystal of desired product **14-30** (415 mg, 73.5 % in 2 steps).

### Experiment 14.18

#### Preparation and Analysis of Compound

##### Compound 158



##### Typical coupling reaction of the precursors and isocyanates:

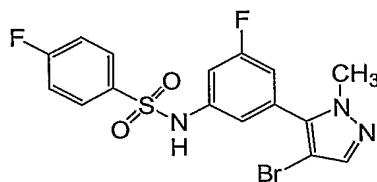
[0407] To a 1 mL oven dried vial, was aniline **14-24** (80 mg, 0.28 mmol, see Experiment 14-11 and Scheme 14-5) dissolved in dichloroethane (0.3 mL) and treated with p-chlorophenyl isocyanate (53 mg, 0.34 mmol) at room temperature.

[0408] After stirring for 12 hrs, the solid was filtered, washed with dichloroethane (0.5 mL) and dried *in vacuo* to afford Compound **158** (90.1 mg, 75%).

### Experiment 14.19

#### Preparation and Analysis of Compound

##### Compound 100



##### Typical coupling reaction of the precursors and sulfonyl halides or acyl halides

[0409] To a 1 mL oven dried vial, was aniline **14-19** (50 mg, 0.17 mmol, see Experiment 14-6 and Scheme 14-3) dissolved in dichloromethane (0.3 mL) and treated with p-fluorophenyl sulfonylchloride (40 mg, 0.20 mmol) and  $\text{Et}_3\text{N}$  (28  $\mu\text{L}$ , 0.21 mmol) at 0 °C. The reaction was warmed

-161-

to room temperature and maintained for 4 hrs. The mixture was poured into H<sub>2</sub>O (10 mL) and extracted with EtOAc (20 mL x 2). The EtOAc was dried over MgSO<sub>4</sub>, concentrated under vacuum and purified over silica gel (EtOAc/Hex = 1/2, R<sub>f</sub> = 0.52) to afford Compound **100** as a white crystal (58 mg, 85%).:

5

**EXAMPLE 15****Experiments 15.1 – 15.22****General Synthetic Strategies, Preparation and Analysis of Compounds**

[0410] Compounds of certain embodiments of the invention were prepared according to the procedures below. The following abbreviations are employed herein:

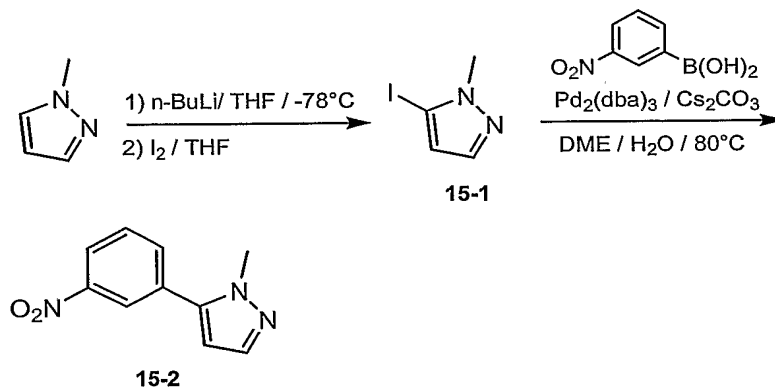
List of Abbreviations:

	DME	Dimethoxyethylene
	THF	Tetrahydrofuran
	Pd <sub>2</sub> (dba) <sub>3</sub>	Tris(dibenzylideneacetone)dipalladium
15	NCS	N-Chlorosuccinimide
	ACC	1,1-Azobis(cyclohexanecarbonitrile)
	DIEA	Diisopropylethylamine
	DMSO	Dimethylsulfoxide
	Hex	Hexanes
20	EtOAc	Ethyl Acetate

**GENERAL SYNTHETIC STRATEGIES**

[0411] *N*-Methyl pyrazole was lithiated with *n*-BuLi in THF at -78°C. The lithiated pyrazole was then exchanged with I<sub>2</sub> to form iodopyrazole **15-1** in 78% yield. Suzuki coupling of **1** with 3-nitrophenylboronic acid provided coupled product **15-2** in 67-98% yield (Scheme **15-1**).

25

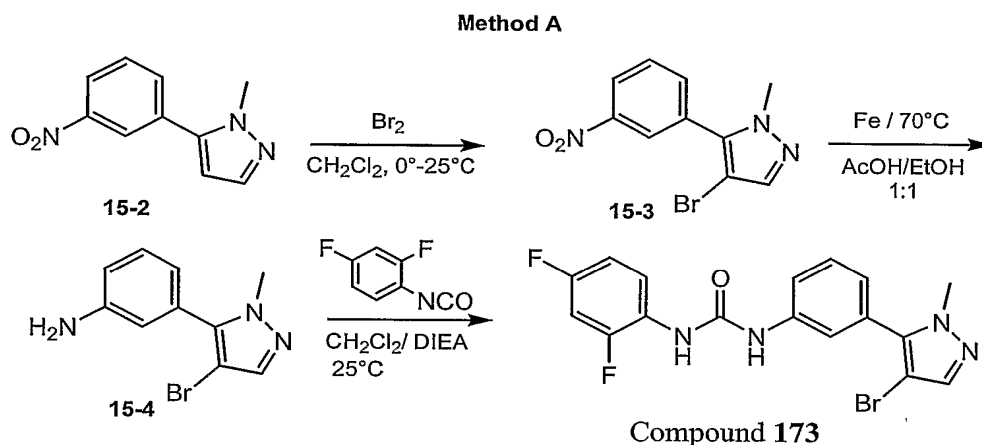


Scheme 15-1

-162-

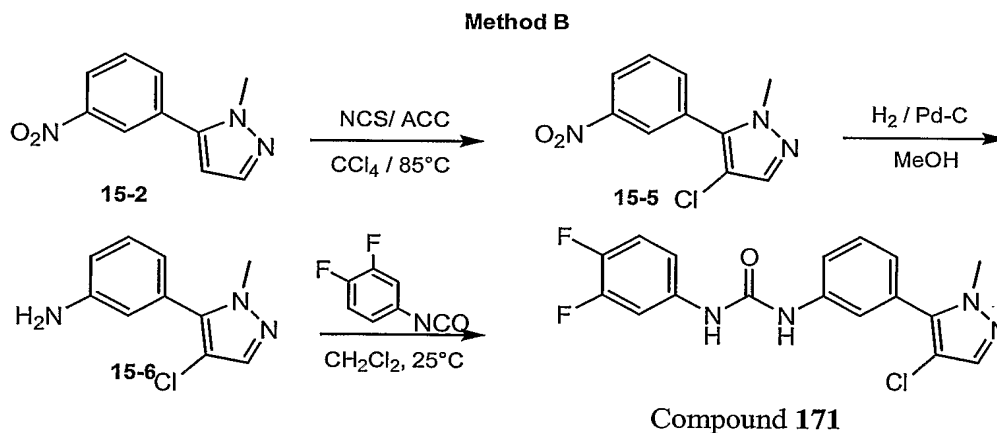
[0412] Pyrazole **15-2** was brominated at 0°C to provide **15-3** in 68% yield. Intermediate **15-3** was then reduced with iron in 1:1 acetic acid/ethanol to afford aniline **15-4** in 80% yield. Aniline **15-4** was subsequently coupled with 2,4-difluorophenylisocyanate at room temperature to provide Compound **173** in 95% yield (Method A, Scheme 15-2).

5



[0413] Separately, Pyrazole **15-2** was chlorinated at 85°C with NCS providing intermediate chloropyrazole **15-5** in 87% yield. Intermediate **15-5** was then reduced with H<sub>2</sub>/Pd-C to provide aniline **15-6** in 88% yield. Aniline **15-6** was subsequently treated with 3,4-difluorophenylisocyanate at room temperature to provide Compound **171** in 85% yield (Method B, Scheme 15-3).

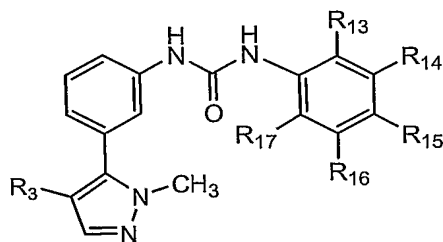
10



[0414] The following compounds shown below were made in a similar manner as described above herein for Compound **173** and Compound **171**.



-163-



(X)

Compound	R <sub>3</sub>	R <sub>13</sub>	R <sub>14</sub>	R <sub>15</sub>	R <sub>16</sub>	R <sub>17</sub>	Method
Compound Name							
165	Br	H	F	F	H	H	A
1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(3,4-difluoro-phenyl)-urea							
166	Br	F	H	H	F	H	A
1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(2,5-difluoro-phenyl)-urea							
167	Br	H	F	H	F	H	A
1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(3,5-difluoro-phenyl)-urea							
168	Br	H	Cl	F	H	H	A
1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(3-chloro-4-fluoro-phenyl)-urea							
169	Br	CF <sub>3</sub>	H	F	H	H	A
1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(4-fluoro-2-trifluoromethyl-phenyl)-urea							
170	Br	H	CF <sub>3</sub>	F	H	H	A
1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(4-fluoro-3-trifluoromethyl-phenyl)-urea							
172	Cl	F	H	H	F	H	B
1-[3-(4-Chloro-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(2,5-difluoro-phenyl)-urea							
174	Br	F	F	F	H	H	A
1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(2,3,4-trifluoro-phenyl)-urea							
175	Cl	H	F	H	F	H	B
1-[3-(4-Chloro-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(3,5-difluoro-phenyl)-urea							
176	Cl	H	Cl	F	H	H	B
1-(3-Chloro-4-fluoro-phenyl)-3-[3-(4-chloro-2-methyl-2H-pyrazol-3-yl)-phenyl]-urea							

-164-

177	Cl	F	H	F	H	H	B
1-[3-(4-Chloro-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(2,4-difluoro-phenyl)-urea							
178	Cl	F	F	F	H	H	B
1-[3-(4-Chloro-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(2,3,4-trifluoro-phenyl)-urea							
179	Cl	CF <sub>3</sub>	H	F	H	H	B
1-[3-(4-Chloro-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(4-fluoro-2-trifluoromethyl-phenyl)-urea							
180	Br	CF <sub>3</sub>	H	Cl	H	H	A
1-[3-(4-Chloro-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(4-chloro-2-trifluoromethyl-phenyl)-urea							
181	Br	H	CF <sub>3</sub>	Cl	H	H	A
1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(4-chloro-3-trifluoromethyl-phenyl)-urea							
182	Cl	H	CF <sub>3</sub>	F	H	H	B
1-[3-(4-Chloro-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(4-fluoro-3-trifluoromethyl-phenyl)-urea							

## PREPARATION AND ANALYSIS OF COMPOUNDS

## Experiment 15.1

## 5 Preparation and Analysis of Compound

5-Iodo-1-*N*-methylpyrazole 15-1

[0415] *N*-Methylpyrazole (10.0 mL, 120.6 mmol) was dissolved in THF (250 mL) and treated with *n*-BuLi (75.6 mL, 120.6 mmol) at  $-78^{\circ}\text{C}$  under dry  $\text{N}_2$ . The reaction was stirred for 30 min at  $-78^{\circ}\text{C}$ . The reaction mixture was treated at  $-78^{\circ}\text{C}$  with  $\text{I}_2$  (30.7 gm, 120.6 mmol) in THF (200 mL). The reaction was allowed to warm to room temperature and stirred an additional 3 hours. The mixture was quenched by the addition of  $\text{NH}_4\text{Cl}$  (200 mL) stirring for 30 min. Extraction with EtOAc (3 x 100 mL) then washing of the organic phase with a 10% solution of  $\text{Na}_2\text{S}_2\text{O}_3$  removed the excess  $\text{I}_2$ . The combined organic layers were then dried over  $\text{Na}_2\text{SO}_4$ , filtered and the solvent removed under reduced pressure to provide 19.6g of 5-Iodo-1-*N*-methylpyrazole 15-1 in 78% yield (the material was used as crude in the next step): LCMS  $m/z$  209  $\text{MH}^+$ .  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\sigma$  7.46 (d,  $J = 2$  Hz, 1H), 6.4 (d,  $J = 2$  Hz, 1H), 3.9 (s, 3H).

-165-

**Experiment 15.2****Preparation and Analysis of Compound****Pyrazole 15-2 (Route-1)**

[0416] The intermediate iodopyrazole **15-1** (588 mg, 2.82 mmol) was dissolved in DME (5 mL) and H<sub>2</sub>O (500  $\mu$ L). To this solution was added 3-nitrophenylboronic acid (943 mg, 5.65 mmol), Cs<sub>2</sub>CO<sub>3</sub> (920 mg, 2.82 mmol) and Pd(Ph<sub>3</sub>P)<sub>4</sub> (555 mg, 0.48 mmol). The mixture was degassed with argon and heated to 80°C for 12 hours. After cooling to room temperature, brine (30 mL) was added and the mixture extracted with EtOAc (3 x 30 mL). The combined organic layers were dried over Na<sub>2</sub>SO<sub>4</sub>, filtered and the solvent removed under reduced pressure. The residue was purified by flash chromatography (SiO<sub>2</sub>, Hexanes/EtOAc gradient elution) to provide 562 mg (98%) of pyrazole **15-2** as a pale yellow solid: LCMS m/z 204 MH<sup>+</sup>. <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>)  $\sigma$  8.25 (s, 1H), 8.22 (dd, J=7.8, 1.0 Hz, 1H), 7.74 (d, J=7.6 Hz, 1H), 7.64 (dd, J=8.0, 8.0 Hz, 1H), 7.52 (m, 1H), 6.39 (m, 1H), 3.92 (m, 3H).

**Pyrazole 15-2 (Route-2)**

[0417] The intermediate iodopyrazole **5-1** (17.4 gm, 83.5 mmol) was dissolved in DME (200 mL) and H<sub>2</sub>O (1 mL). To this solution was added 3-nitrophenylboronic acid (14.0 gm, 83.5 mmol), Cs<sub>2</sub>CO<sub>3</sub> (27.4 gm, 83.5 mmol) and Pd<sub>2</sub>(dba)<sub>3</sub> (1.37 gm, 14 mmol). The mixture was degassed with argon and heated to 80°C for 12 hours. After cooling to room temperature, brine (100 mL) was added and the mixture extracted with EtOAc (2 x 100 mL). The combined organic layers were dried over Na<sub>2</sub>SO<sub>4</sub>, filtered and the solvent removed under reduced pressure. The residue was purified by flash chromatography (SiO<sub>2</sub>, Hexanes/EtOAc gradient elution) to provide 17.1 gm (67%) of Pyrazole **15-2** as a pale yellow solid: LCMS m/z 204 MH<sup>+</sup>. <sup>1</sup>H NMR (400MHz, CDCl<sub>3</sub>)  $\sigma$  8.25 (s, 1H), 8.22 (dd, J=7.8, 1.0 Hz, 1H), 7.74 (d, J=7.6 Hz, 1H), 7.64 (dd, J=8.0, 8.0 Hz, 1H), 7.52 (m, 1H), 6.39 (m, 1H), 3.92 (m, 3H).

**Experiment 15.3****Preparation and Analysis of Compound****Method A****Bromopyrazole 15-3**

[0418] Pyrazole **15-2** (5.79 g, 28.5 mmol) was dissolved in 150 mL of CH<sub>2</sub>Cl<sub>2</sub> and cooled to 0°C. Bromine (5.40 g, 34.2 mmol) in CH<sub>2</sub>Cl<sub>2</sub> (55 mL) was added drop wise under argon over 30 minutes. After the addition was complete, the reaction mixture stirred for 3 hours at room temp. The

reaction mixture was quenched with a saturated solution of  $\text{Na}_2\text{S}_2\text{O}_3$  and 1N NaOH. The layers were separated and the aqueous layer was extracted with  $\text{CH}_2\text{Cl}_2$  (2x200 ml). The organic layers were combined, dried over  $\text{Na}_2\text{SO}_4$ , and the solvent removed under reduced pressure. The residue was purified by flash chromatography ( $\text{SiO}_2$ , Hexanes/EtOAc gradient elution) to provide 5.4 gm (68%) of Bromopyrazole **15-3** and 1.1 gm (14%) of unreacted starting material. LCMS  $m/z$  (%) = 284 ( $\text{M}+\text{H}^{81}\text{Br}$ , 100), 282 ( $\text{M}+\text{H}^{79}\text{Br}$ , 89).  $^1\text{H}$  NMR (400MHz,  $\text{CDCl}_3$ )  $\sigma$  8.33 (d,  $J=6.0$  Hz, 1H), 8.29 (s, 1H), 7.77 (d,  $J=8.0$  Hz, 1H), 7.71 (dd,  $J=8.0$  Hz, 1H), 7.56 (s, 1H), 3.87 (s, 3H).

#### Intermediate **15-4**:

- 10 **[0419]** A slurry of pyrazole **15-3** (2.05 g, 7.26 mmol) in a 1:1 mixture of acetic acid and ethanol (30 ml) was treated with iron powder (1.62 g, 29.0 mol) and heated to 70°C for 4 hours. The reaction mixture was allowed to cool to room temperature and 1N NaOH (100 ml) was added to form white precipitate (FeOH). EtOAc (100 mL) was added and filtered through celite. The organic layer was separated and the aqueous layer was extracted with EtOAc (2x100 ml). The organic layers were
- 15 combined and dried over  $\text{Na}_2\text{SO}_4$ , filtered, and concentrated to afford 1.46 g of **15-4**, in 80% yield as a white solid. LCMS  $m/z$  (%) = 254 ( $\text{M}+\text{H}^{81}\text{Br}$ , 100), 252 ( $\text{M}+\text{H}^{79}\text{Br}$ , 96).  $^1\text{H}$  NMR (400MHz,  $\text{CDCl}_3$ )  $\sigma$  7.50 (s, 2H), 7.26 (m, 2H), 6.75 (m, 2H), 6.68 (s, 1H), 3.81 (s, 3H).

#### Experiment 15.4

- 20 **Preparation and Analysis of Compound**  
Compound **173**

- [0420]** Intermediate **4** (209 mg, 0.83 mmol, see Experiment **15.3**) was dissolved in 3 mL of  $\text{CH}_2\text{Cl}_2$ , treated with 2,4-difluorophenylisocyanate (385 mg, 2.49 mmol), diisopropylethylamine (168 mg, 1.66 mmol), and stirred at room temperature overnight. The solvent was removed under reduced
- 25 pressure, dissolved in DMSO (5 ml), and purified by preparative HPLC to afford **Compound 173** as a white solid, 325 mg, 97% yield: LCMS  $m/z$  (%) = 409 ( $\text{M}+\text{H}^{81}\text{Br}$ , 100), 407 ( $\text{M}+\text{H}^{79}\text{Br}$ , 97).  $^1\text{H}$  NMR (400 MHz,  $\text{DMSO}-d_6$ )  $\sigma$  9.20 (s, 1H), 8.55 (s, 1H), 8.04 (m, 1H), 7.64 (m, 1H), 7.59 (s, 1H), 7.51 (d,  $J=8.4$  Hz, 1H), 7.44 (dd,  $J=7.8$  Hz, 1H), 7.29 (m, 1H), 7.09 (d,  $J=7.2$  Hz, 1H), 7.03 (dd,  $J=8.8$  Hz, 1H), 3.77 (s, 3H).

-167-

**Experiment 15.5****Preparation and Analysis of Compound****Compound 165**

- 5      **[0421]**      Intermediate 4 was treated with 3,4-difluorophenylisocyanate, in a similar manner to Compound 173, providing a 99% yield of Compound 165: LCMS m/z (%) = 409 (M+H<sup>81</sup>Br, 100), 407 (M+H<sup>79</sup>Br, 97). <sup>1</sup>H NMR (400 MHz, DMSO-d<sub>6</sub>)  $\sigma$  8.98 (s, 2H), 7.57 (m, 3H), 7.44 (dd, J=8.0 Hz, 1H), 7.36 (d, J=9.2 Hz, 1H), 7.31 (d, J=9.6 Hz, 1H), 7.10 (m, 2H), 3.78 (s, 3H).

**Experiment 15.6**10      **Preparation and Analysis of Compound****Compound 166**

- 15      **[0422]**      Intermediate 4 was treated with 2,5-difluorophenylisocyanate, in a similar manner to Compound 173, providing a 76% yield of Compound 166: LCMS m/z (%) = 409 (M+H<sup>81</sup>Br, 100), 407 (M+H<sup>79</sup>Br, 97). <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>)  $\sigma$  7.93 (m, 1H), 7.79 (s, 1H), 7.73 (s, 1H), 7.57 (s, 1H), 7.50 (s, 1H), 7.24 (m, 2H), 7.10 (d, J=6.8 Hz, 1H), 6.96 (m, 1H), 6.64 (m, 1H), 3.82 (s, 3H).

**Experiment 15.7****Preparation and Analysis of Compound****Compound 167**

- 20      **[0423]**      Intermediate 4 was treated with 3,5-difluorophenylisocyanate, in a similar manner to Compound 173, after chromatography on silica (Chromatatron, Hex/EtOAc gradient), providing a 45% yield of Compound 167: LCMS m/z (%) = 409 (M+H<sup>81</sup>Br, 100), 407 (M+H<sup>79</sup>Br, 96). <sup>1</sup>H NMR (400 MHz, Acetone- d<sub>6</sub>)  $\sigma$  8.59 (s, 1H), 8.47 (s, 1H), 7.68 (s, 1H), 7.64 (d, J=8.0 Hz, 1H), 7.52 (s, 1H), 7.47 (dd, J=7.8 Hz, 1H), 7.24 (J=9.6 Hz, 2H), 7.14 (d, J=7.6 Hz, 1H), 6.61 (dd, J=8.6 Hz, 1H), 3.83 (s, 3H).

**Experiment 15.8****Preparation and Analysis of Compound**30      **Compound 168**

- [0424]**      Intermediate 4 was treated with 3-chloro-4-fluorophenylisocyanate, in a similar manner to Compound 173, providing a 91% yield of Compound 168: LCMS m/z (%) = 427 (M+H<sup>81</sup>Br, <sup>37</sup>Cl, 33), 425 (M+H<sup>81</sup>Br, <sup>35</sup>Cl & <sup>79</sup>Br, <sup>37</sup>Cl, 100), 423 (M+H<sup>79</sup>Br, <sup>35</sup>Cl, 63). <sup>1</sup>H NMR (400

-168-

MHz. Acetone-  $d_6$ )  $\sigma$  8.41 (s, 1H), 8.37 (s, 1H), 7.87 (m, 1H), 7.69 (m, 1H), 7.62 (d,  $J=2.4$  Hz, 1H), 7.52 (s, 1H), 7.45 (dd,  $J=7.8$  Hz, 1H), 7.38 (m, 1H), 7.21 (dd,  $J=9.0$  Hz, 1H), 7.12 (d,  $J=6.8$  Hz, 1H), 3.83 (s, 3H).

## 5 Experiment 15.9

### Preparation and Analysis of Compound

#### Compound 169

[0425] Intermediate 4 was treated with 2-trifluoromethyl-4-fluorophenylisocyanate, in a similar manner to Compound 173, providing a 47% yield of Compound 169: LCMS  $m/z$  (%) = 459 (M+H<sup>81</sup>Br, 100), 457 (M+H<sup>79</sup>Br, 78). <sup>1</sup>H NMR (400 MHz. DMSO- $d_6$ )  $\sigma$  9.47 (s, 1H), 8.64 (s, 1H), 8.16 (s, 1H), 7.86 (m, 1H), 7.76 (m, 1H), 7.64 (s, 1H), 7.54 (m, 2H), 7.45 (dd,  $J=7.8$  Hz, 1H), 7.09 (d,  $J=7.2$  Hz, 1H), 3.77 (s, 3H).

## Experiment 15.10

### 15 Preparation and Analysis of Compound

#### Compound 170

[0426] Intermediate 4 was treated with 3-trifluoromethyl-4-fluorophenylisocyanate, in a similar manner to Compound 173, providing a 56% yield of Compound 170: LCMS  $m/z$  (%) = 459 (M+H<sup>81</sup>Br, 100), 457 (M+H<sup>79</sup>Br, 82). <sup>1</sup>H NMR (400 MHz. DMSO- $d_6$ )  $\sigma$  9.13 (s, 1H), 9.04 (s, 1H), 7.98 (m, 1H), 7.64 (m, 2H), 7.58 (s, 1H), 7.55 (d,  $J=8.4$  Hz, 1H), 7.45 (m, 2H), 7.09 (d,  $J=8.8$  Hz, 1H), 3.77 (s, 3H).

## Experiment 15.11

### 25 Preparation and Analysis of Compound

#### Compound 174

[0427] Intermediate 4 was treated with 2,3,4-trifluorophenylisocyanate, in a similar manner to Compound 173, providing a 22% yield of Compound 174: LCMS  $m/z$  (%) = 427 (M+H<sup>81</sup>Br, 100), 425 (M+H<sup>79</sup>Br, 78). <sup>1</sup>H NMR (400 MHz. Acetone-  $d_6$ )  $\sigma$  8.74 (s, 1H), 8.22 (s, 1H), 8.01 (m, 1H), 7.71 (m, 1H), 7.64 (d,  $J=8.0$  Hz, 1H), 7.52 (s, 1H), 7.48 (dd,  $J=7.8$  Hz, 1H), 7.15 (m, 2H), 3.84 (s, 3H).

-169-

**Experiment 15.12****Preparation and Analysis of Compound****Compound 180**

5 [0428] Intermediate **4** was treated with 2-trifluoromethyl-4-chlorophenylisocyanate, in a similar manner to Compound **173**, after chromatography on silica (Biotage, Hex/EtOAc gradient) provided Compound **180** in a 73% yield: LCMS m/z (%) = 477 (M+H<sup>81</sup>Br, <sup>37</sup>Cl, 40), 475 (M+H<sup>81</sup>Br, <sup>35</sup>Cl & <sup>79</sup>Br, <sup>37</sup>Cl, 100), 473 (M+H<sup>79</sup>Br, <sup>35</sup>Cl, 72). <sup>1</sup>H NMR (400 MHz, Acetone-d<sub>6</sub>)  $\sigma$  9.04 (s, 1H), 8.19 (d, J=9.2 Hz, 1H), 7.77 (s, 1H), 7.66 (m, 4H), 7.52 (s, 1H), 7.48 (dd, J=8.0 Hz, 1H), 7.14 (d, J=7.6, 1H), 3.83 (s, 3H).

10

**Experiment 15.13****Preparation and Analysis of Compound****Compound 181**

15 [0429] Intermediate **4** was treated with 3-trifluoromethyl-4-chlorophenylisocyanate, in a similar manner to Compound **173**, providing a 56% yield of Compound **181**: LCMS m/z (%) = 477 (M+H<sup>81</sup>Br, <sup>37</sup>Cl, 34), 475 (M+H<sup>81</sup>Br, <sup>35</sup>Cl & <sup>79</sup>Br, <sup>37</sup>Cl, 100), 473 (M+H<sup>79</sup>Br, <sup>35</sup>Cl, 62). <sup>1</sup>H NMR (400 MHz, Acetone-d<sub>6</sub>)  $\sigma$  8.85 (s, 1H), 8.72 (s, 1H), 8.16 (d, J=2.8 Hz, 1H), 7.77 (s, J=8.8Hz, 1H), 7.71 (s, 1H), 7.67 (d, J=8.4 Hz, 1H), 7.55 (d, J=8.8 Hz, 1H), 7.52 (s, 1H), 7.48 (dd, J=7.8 Hz, 1H), 7.14 (d, J=8.8, 1H), 3.84 (s, 3H).

20

**Experiment 15.14****Preparation and Analysis of Compound****Method B:****Chloropyrazole 15-5**

25 [0430] Pyrazole **15-2** (2.51 g, 12.3 mmol) was dissolved in 70 ml of CCl<sub>4</sub> and heated to 85°C under reflux. *N*-Chlorosuccinimide (1.81 g, 13.6 mmol) and 1,1-Azobis (cyclohexanecarbonitrile) were added and stirred overnight. The reaction mixture was allowed to cool to room temperature then to 0°C and the white precipitate filtered off. The solvent was removed under reduced pressure and purified by flash chromatography (SiO<sub>2</sub>, Hexanes/EtOAc gradient elution) to provide 2.54 g, 87%  
30 yield of chloropyrazole **15-5**. LCMS m/z (%) = 240 (M+H<sup>37</sup>Cl, 54), 238 (M+H<sup>35</sup>Cl, 100). <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>)  $\sigma$  8.33 (d, J=8.4 Hz, 1H), 8.31 (s, 1H), 7.78 (d, J=7.6 Hz, 1H), 7.72 (dd, J=7.8 Hz, 1H), 7.55 (s, 1H), 3.87 (s, 3H).

-170-

Intermediate **15-6**:

[0431] A slurry of the chloropyrazole **15-5** (973 mg, 4.09 mmol) was reduced at 55 psi H<sub>2</sub> / Pd-C for 4 hours to provide 749 mg of intermediate **15-6** in 88% yield. LCMS m/z (%) = 210 (M+H<sup>37</sup>Cl, 68), 208 (M+H<sup>35</sup>Cl, 100). <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>)  $\sigma$  7.47 (s, 2H), 7.29 (s, 1H), 7.25 (dd, J=3.8 Hz, 1H), 6.77 (d, J=2.0 Hz, 1H), 6.75 (d, J=2.0 Hz, 1H), 6.7 (m, 1H), 3.81 (s, 3H).

**Experiment 15.15****Preparation and Analysis of Compound****Compound 171**

[0432] Intermediate **15-6** (200 mg, 0.96 mmol) was dissolved in 3 mL of CH<sub>2</sub>Cl<sub>2</sub>, treated with 3,4-difluorophenylisocyanate (4.49 mg, 2.89 mmol), diisopropylethylamine (194 mg, 1.92 mmol), and stirred at room temperature overnight. The solvent was removed under reduced pressure, dissolved in DMSO (5 ml), and purified by preparative HPLC to afford Compound **171** as a white solid, 298 mg, 85% yield: LCMS m/z (%) = 365 (M+H<sup>37</sup>Cl, 27), 363 (M+H<sup>35</sup>Cl, 100). <sup>1</sup>H NMR (400 MHz, DMSO-d<sub>6</sub>)  $\sigma$  8.95 (m, 2H), 7.62 (m, 3H), 7.52 (d, J=8.0 Hz, 1H), 7.45 (dd, J=7.8 Hz, 1H), 7.32 (m, 1H), 7.10 (m, 2H), 3.77 (s, 3H).

**Experiment 15.16****Preparation and Analysis of Compound****Compound 172**

[0433] Intermediate **6** was treated with 2,5-difluorophenylisocyanate, in a similar manner to Compound **171**, after chromatography on silica (Biotage, Hex/EtOAc gradient) providing a 57% yield of Compound **172**: LCMS m/z (%) = 365 (M+H<sup>37</sup>Cl, 32), 363 (M+H<sup>35</sup>Cl, 100). <sup>1</sup>H NMR (400 MHz, CD<sub>3</sub>OD)  $\sigma$  7.99 (m, 1H), 7.63 (s, 1H), 7.49 (m, 2H), 7.44 (dd, J=8.0 Hz, 1H), 7.10 (m, 3H), 6.69 (m, 2H), 3.81 (s, 3H).

**Experiment 15.17****Preparation and Analysis of Compound****Compound 175**

[0434] Intermediate **6** was treated with 3,5-difluorophenylisocyanate, in a similar manner to Compound **171**, after chromatography on silica (Biotage, Hex/EtOAc gradient) providing a 20% yield of Compound **175**: LCMS m/z (%) = 365 (M+H<sup>37</sup>Cl, 27), 363 (M+H<sup>35</sup>Cl, 100). <sup>1</sup>H NMR (400 MHz,



-171-

CDCl<sub>3</sub>)  $\sigma$  7.50 (s, 1H), 7.44 (s, 1H), 7.43 (s, 1H), 7.36 (s, 1H), 7.25 (s, 2H), 7.14 (m, 1H), 6.98 (d, J=6.8 Hz, 2H), 6.49 (m, 1H), 3.82 (s, 3H).

**Experiment 15.18****5 Preparation and Analysis of Compound****Compound 176**

[0435] Intermediate 6 was treated with 3-chloro-4-fluorophenylisocyanate, in a similar manner to Compound 171, after chromatography on silica (Biotage, Hex/EtOAc gradient) providing a 21% yield of Compound 176: LCMS m/z (%) = 383 (M+H<sup>37</sup>Cl, <sup>37</sup>Cl, 19), 381 (M+H<sup>37</sup>Cl, <sup>35</sup>Cl, 73),  
10 379 (M+H<sup>35</sup>Cl, <sup>35</sup>Cl, 100). <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>)  $\sigma$  7.50 (m, 2H), 7.43 (m, 2H), 7.25 (s, 1H), 7.19 (m, 1H), 7.13 (m, 1H), 7.06 (dd, J=8.6 Hz, 1H), 6.99 (s, 1H), 6.95 (s, 1H), 3.82 (s, 3H).

**Experiment 15.19****Preparation and Analysis of Compound****15 Compound 177**

[0436] Intermediate 6 was treated with 2,4-difluorophenylisocyanate, in a similar manner to Compound 171, after chromatography on silica (Biotage, Hex/EtOAc gradient) providing a 37% yield of Compound 177: LCMS m/z (%) = 365 (M+H<sup>37</sup>Cl, 32), 363 (M+H<sup>35</sup>Cl, 100). <sup>1</sup>H NMR (400 MHz, DMSO-d<sub>6</sub>)  $\sigma$  9.20 (s, 1H), 8.55 (s, 1H), 8.04 (m, 1H), 7.64 (s, 1H), 7.59 (s, 1H), 7.50 (d, J=5.6 Hz,  
20 1H), 7.44 (dd, J=7.8, 1H), 7.29 (m, 1H), 7.09 (d, J=6.0, 1H), 7.03 (dd, J=8.8, 1H), 3.77 (s, 3H).

**Experiment 15.20****Preparation and Analysis of Compound****Compound 178**

25 [0437] Intermediate 6 was treated with 2,3,4-trifluorophenylisocyanate, in a similar manner to Compound 171, after chromatography on silica (Biotage, Hex/EtOAc gradient) providing a 45% yield of Compound 178: LCMS m/z (%) = 383 (M+H<sup>37</sup>Cl, 52), 381 (M+H<sup>35</sup>Cl, 100). <sup>1</sup>H NMR (400 MHz, Acetone-d<sub>6</sub>)  $\sigma$  8.68 (s, 1H), 8.17 (s, 1H), 8.02 (m, 2H), 7.72 (s, 1H), 7.63 (d, J=7.2 Hz, 1H), 7.51 (s, 1H), 7.48 (d, J=8.4 Hz, 1H), 7.16 (m, 1H), 3.83 (s, 3H).

-172-

**Experiment 15.21****Preparation and Analysis of Compound****Compound 179**

5     **[0438]**         Intermediate **6** was treated with 2-trifluoromethyl-4-fluorophenylisocyanate, in a similar manner to Compound **171**, after chromatography on silica (Biotage, Hex/EtOAc gradient) providing a 32% yield of Compound **179**: LCMS (%) = 415 (M+H<sup>37</sup>Cl, 48), 413 (M+H<sup>35</sup>Cl, 100). <sup>1</sup>H NMR (400 MHz, Acetone-d<sub>6</sub>)  $\delta$  8.92 (s, 1H), 8.15 (s, 1H), 8.07 (dd, J=6.8 Hz, 1H), 7.96 (m, 1H), 7.72 (m, 1H), 7.62 (d, J=7.6 Hz, 1H), 7.49 (m, 3H), 7.14 (d, J=7.6 Hz, 1H), 3.82 (s, 3H).

10     **Experiment 15.22****Preparation and Analysis of Compound****Compound 182**

15     **[0439]**         Intermediate **4** was treated with 3-trifluoromethyl-4-fluorophenylisocyanate, in a similar manner to Compound **171**, providing a 71% yield of Compound **182**: LCMS m/z (%) = 415 (M+H<sup>37</sup>Cl, 79), 413 (M+H<sup>35</sup>Cl, 100). <sup>1</sup>H NMR (400 MHz, Acetone-d<sub>6</sub>)  $\delta$  8.50 (s, 1H), 8.45 (s, 1H), 8.04 (d, J=8.8 Hz, 1H), 7.76 (m, 1H), 7.71 (s, 1H), 7.62 (d, J=8.0 Hz, 1H), 7.51 (s, 1H), 7.48 (dd, J=7.8 Hz, 1H), 7.33 (dd, J=9.6 Hz, 1H), 7.15 (d, J=7.2 Hz, 1H), 3.83 (s, 3H).

**EXAMPLE 16**

20

**Experiments 16.1 – 16.5****General Synthetic Strategies, Preparation and Analysis of Compounds**

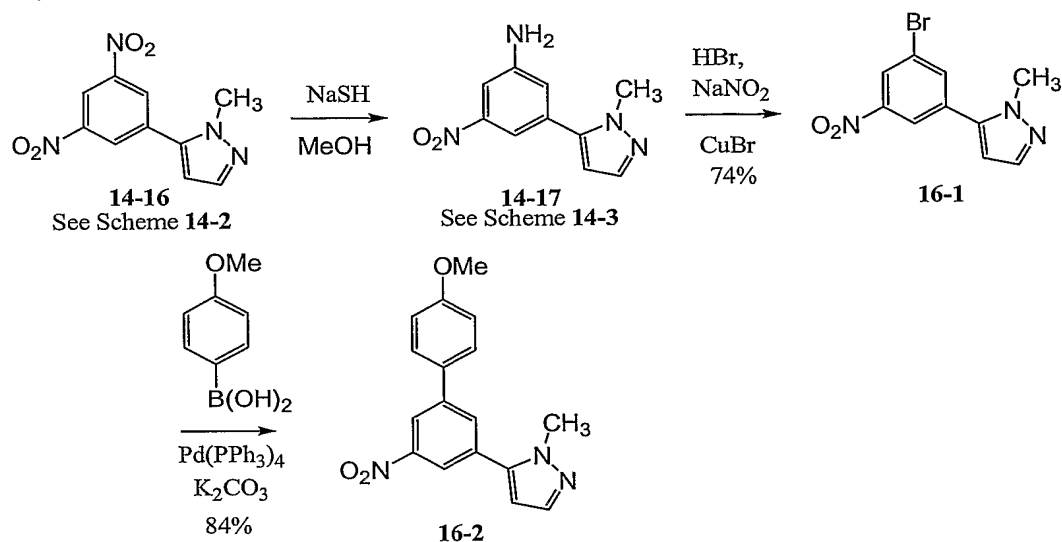
**[0440]**         Compounds of certain embodiments of the invention were prepared according to the procedures below.

25     **General Synthetic Strategies**

**[0441]**         Various aryl functionalities were introduced on the phenyl ring. By way of example, dinitro **14-15** (see Scheme **14-2**) was reduced with NaSH in ethanol under reflux conditions, followed by bromination under Sandmeyer's conditions to afford Aryl bromide **16-1** in 56 % yield (2 steps). Aryl bromide **16-1** was coupled with *p*-methoxyphenyl boronic acid with Pd(PPh<sub>3</sub>)<sub>4</sub> and K<sub>2</sub>CO<sub>3</sub> as a  
30     base in dioxane to furnish the coupled product **16-2** (Scheme **16-1**). The reaction was very clean and the desired product was purified by recrystallization in ethanol. Coupled product **16-2** was subsequently brominated with Br<sub>2</sub> in dichloromethane at room temperature (i.e., **16-3**) followed by

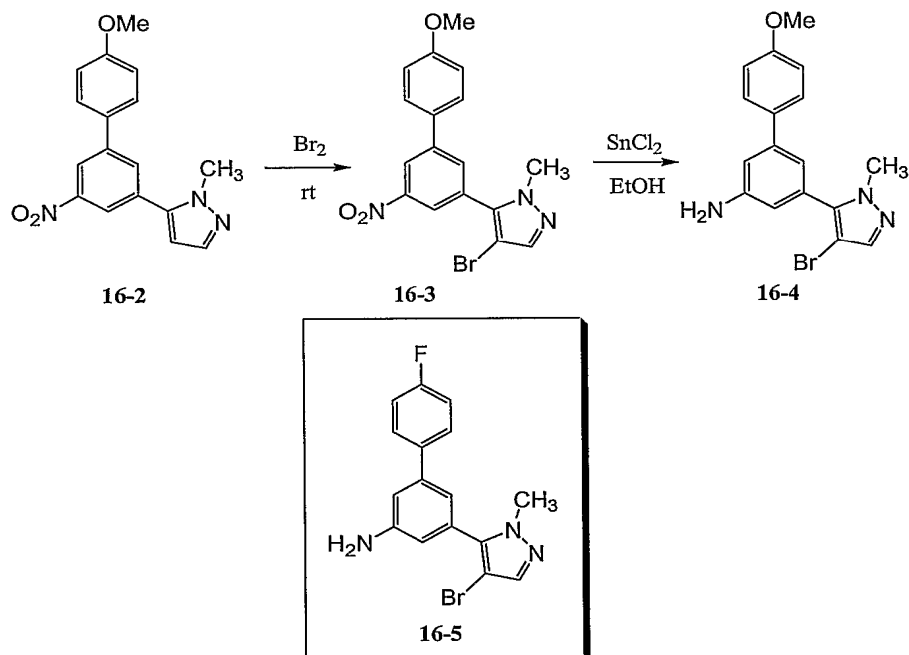
-173-

reduction with  $\text{SnCl}_2 \cdot 2\text{H}_2\text{O}$  in Ethanol to furnish the aniline precursor **16-4**. 4-Fluorophenyl functionality was also introduced on the ring in a similar manner (Scheme 16-2).



Scheme 16-1

5

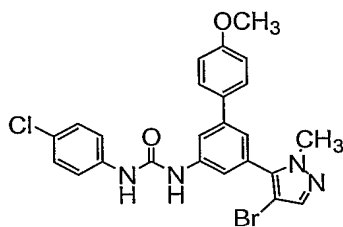


Scheme 16-2

[0442] Anilines **16-4** and **16-5** were coupled with various isocyanates, acyl halides and sulfonyl halides to form urea, amide and sulfonamide type molecules respectively in good yields. The tables of the new compounds are shown below (TABLES 16-1 and 16-2).

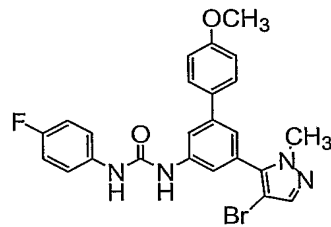
5

**TABLE 16-1** Compounds of the invention containing *p*-methoxyphenyl functionality.



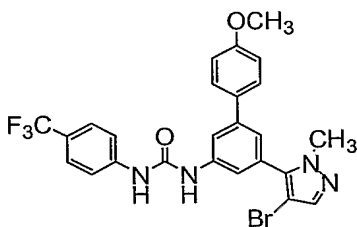
**Compound 191**

1-[5-(4-Bromo-2-methyl-2*H*-pyrazol-3-yl)-4'-methoxy-biphenyl-3-yl]-3-(4-chloro-phenyl)-urea



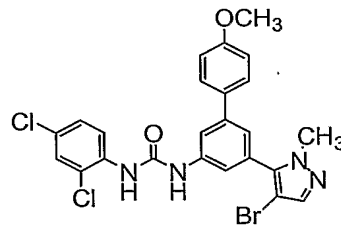
**Compound 192**

1-[5-(4-Bromo-2-methyl-2*H*-pyrazol-3-yl)-4'-methoxy-biphenyl-3-yl]-3-(4-fluoro-phenyl)-urea



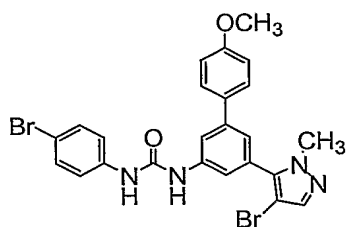
**Compound 186**

1-[5-(4-Bromo-2-methyl-2*H*-pyrazol-3-yl)-4'-methoxy-biphenyl-3-yl]-3-(4-trifluoromethyl-phenyl)-urea



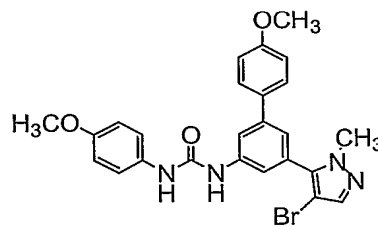
**Compound 187**

1-[5-(4-Bromo-2-methyl-2*H*-pyrazol-3-yl)-4'-methoxy-biphenyl-3-yl]-3-(2,4-dichloro-phenyl)-urea



**Compound 200**

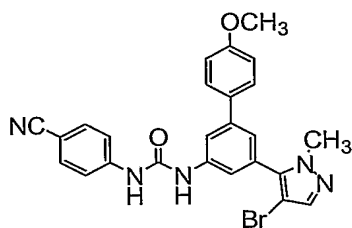
1-[5-(4-Bromo-2-methyl-2*H*-pyrazol-3-yl)-4'-methoxy-biphenyl-3-yl]-3-(4-bromo-phenyl)-urea



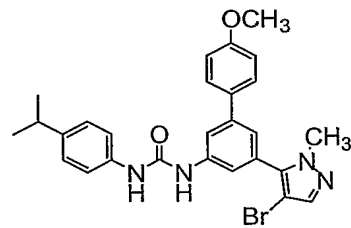
**Compound 198**

1-[5-(4-Bromo-2-methyl-2*H*-pyrazol-3-yl)-4'-methoxy-biphenyl-3-yl]-3-(4-methoxy-phenyl)-urea

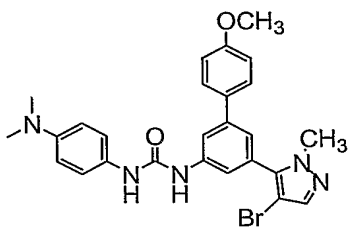
-175-

**Compound 196**

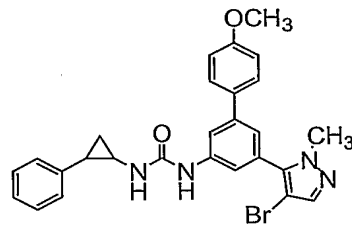
1-[5-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-4'-methoxy-biphenyl-3-yl]-3-(4-cyano-phenyl)-urea

**Compound 201**

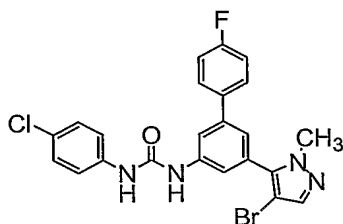
1-[5-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-4'-methoxy-biphenyl-3-yl]-3-(4-isopropyl-phenyl)-urea

**Compound 185**

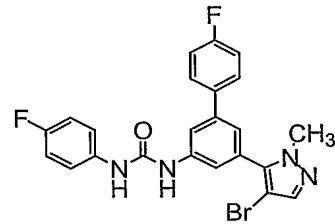
1-[5-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-4'-methoxy-biphenyl-3-yl]-3-(4-dimethylamino-phenyl)-urea

**Compound 202**

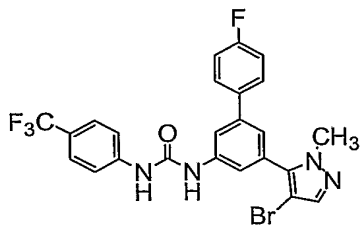
1-[5-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-4'-methoxy-biphenyl-3-yl]-3-(2-phenyl-cyclopropyl)-urea

**TABLE 16-1** Compounds of the invention containing *p*-fluorophenyl functionality.**Compound 199**

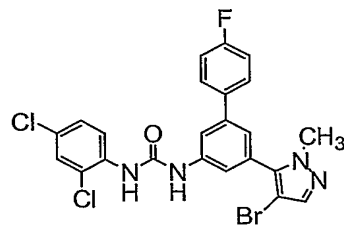
1-[5-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-4'-fluoro-biphenyl-3-yl]-3-(4-chloro-phenyl)-urea

**Compound 204**

1-[5-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-4'-fluoro-biphenyl-3-yl]-3-(4-fluoro-phenyl)-urea

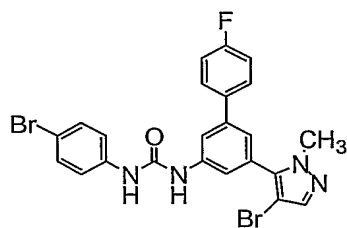
**Compound 190**

1-[5-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-4'-fluoro-biphenyl-3-yl]-3-(4-trifluoromethyl-phenyl)-urea

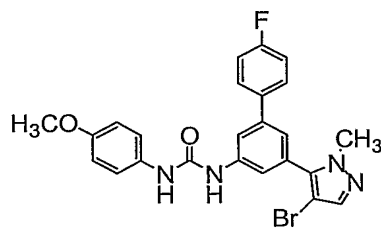
**Compound 194**

1-[5-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-4'-fluoro-biphenyl-3-yl]-3-(2,4-dichloro-phenyl)-urea

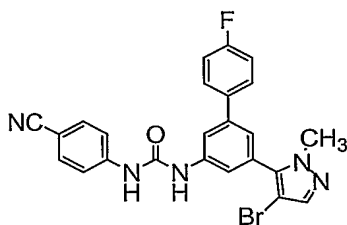
-176-

**Compound 197**

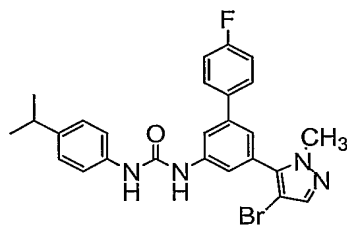
1-[5-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-4'-fluoro-biphenyl-3-yl]-3-(4-bromo-phenyl)-urea

**Compound 188**

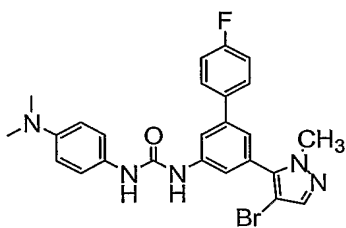
1-[5-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-4'-fluoro-biphenyl-3-yl]-3-(4-methoxy-phenyl)-urea

**Compound 193**

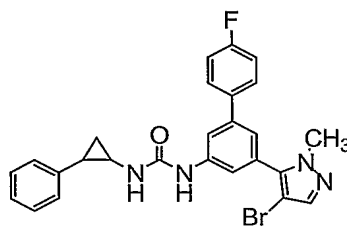
1-[5-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-4'-fluoro-biphenyl-3-yl]-3-(4-cyano-phenyl)-urea

**Compound 195**

1-[5-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-4'-fluoro-biphenyl-3-yl]-3-(4-isopropyl-phenyl)-urea

**Compound 189**

1-[5-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-4'-fluoro-biphenyl-3-yl]-3-(4-dimethylamino-phenyl)-urea

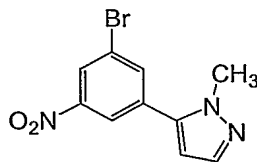
**Compound 203**

1-[5-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-4'-fluoro-biphenyl-3-yl]-3-(2-phenyl-cyclopropyl)-urea

## 5 Experiment 16.1

### Preparation and Analysis of Compound

Aryl bromide 16-1:



[0443] **Aniline 14-17** (9.89 g, 39.9 mmol, Experiment 14.4 and Scheme 14-3) was dissolved in MeOH (150 mL) and toluene (50 mL) and refluxed to dissolve all solids. NaSH (6.0 g, 107.7

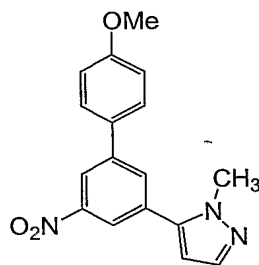
-177-

mmol) in MeOH (50 mL) was added into the solution for 45 min. The reaction mixture was stirred for 30 min at the same temperature and cooled to room temperature. The reaction mixture was concentrated under vacuum and dissolved in EtOAc (250 mL). The EtOAc was washed with H<sub>2</sub>O (100 mL x 2), dried over MgSO<sub>4</sub> and concentrated to afford crude Aniline **14-17**. The crude Aniline **14-17** was added into 45% HBr (50 mL) at 0 °C and warmed to room temperature. After stirring for 30 min, the solution was cooled to -30 °C and NaNO<sub>2</sub> (2.75 g, 39.9 mmol) added portionwise for 10 min. The reaction mixture was maintained at the same temperature for 30 min. The mixture was heated to 100 °C and stirred for 10 min. The reaction mixture was cooled to room temperature and quenched with crushed ice (250 g). The crude product was extracted with EtOAc (250 mL), dried over MgSO<sub>4</sub> and concentrated under vacuum. The crude material was purified by column chromatograph (EtOAc/Hex = 1/1, R<sub>f</sub> = 0.85) to afford the desired product as a white crystal Aryl bromide **16-1** (5.8 g, 52.1 % in 2 steps).

## Experiment 16.2

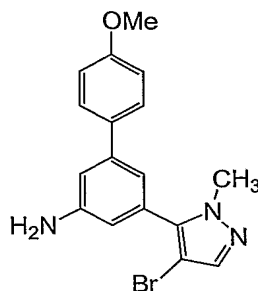
### Preparation and Analysis of Compound

#### Biaryl **16-2**:



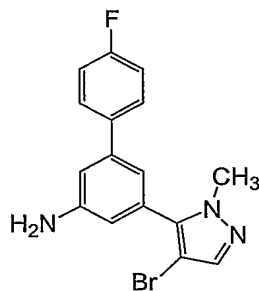
[0444] Aryl bromide **16-1** (700 mg, 2.5 mmol), *p*-methoxyphenyl boronic acid (380 mg, 2.5 mmol) and Pd(PPh<sub>3</sub>)<sub>4</sub> (289 mg, 0.25mmol) were directly weighed into a 25 mL round-bottom flask and dissolved in dioxane (10 mL). The solution was treated with K<sub>2</sub>CO<sub>3</sub> (760 mg, 5.5 mmol) in H<sub>2</sub>O (2.75 mL) and heated to 80 °C. After stirring for 4 hrs, the reaction was poured into H<sub>2</sub>O (50 mL) and extracted with EtOAc (20 mL x 2). The EtOAc was dried over MgSO<sub>4</sub> and concentrated under vacuum. The residue was purified over silica gel (EtOAc/Hex = 1/2, R<sub>f</sub> = 0.64) to afford Biaryl **16-2** as a white crystal (649 mg, 84.2%).:

-178-

**Experiment 16.3****Preparation and Analysis of Compound**Amino biaryl **16-4**:

- 5 [0445] To the solution of Biaryl **16-2** (618 mg, 2.0 mmol) in dichloromethane (5 mL), was added dropwise Br<sub>2</sub> (128 μL, 2.5 mmol) in dichloromethane (1 mL) for 5 min at 0 °C. After addition of Br<sub>2</sub>, the reaction mixture was warmed to room temperature and stirred for 2 hrs. The reaction mixture was washed with H<sub>2</sub>O (10 mL), concentrated under vacuum and triturated in EtOH to afford yellowish crystals. A 5 mL round-bottom flask was charged with the solids and SnCl<sub>2</sub>•2H<sub>2</sub>O (2.61 g, 10.0 mmol) and dissolved in EtOH (5 mL). The mixture was refluxed for 1.5 hrs and cooled to room temperature. The reaction was concentrated under vacuum and extracted with EtOAc (20 mL x 2) and H<sub>2</sub>O (20 mL). The EtOAc was dried over MgSO<sub>4</sub>, concentrated under vacuum and purified over silica gel (EtOAc/Hex = 1/2, R<sub>f</sub> = 0.25) to afford the desire Amino biaryl **16-4** as white crystals (583 mg, 82% in 2 steps).

15

**Experiment 16.4****Preparation and Analysis of Compound**Amino biaryl **16-5**:

- 20 [0446] Aryl bromide **16-1** (1.28 g, 4.57 mmol), *p*-fluorophenyl boronic acid (700 mg, 5.0 mmol) and Pd(PPh<sub>3</sub>)<sub>4</sub> (578 mg, 0.5 mmol) were directly weighed into a 50 mL round-bottom flask and dissolved in dioxane (30 mL). The solution was treated with K<sub>2</sub>CO<sub>3</sub> (1.38 g, 10.0 mmol) in H<sub>2</sub>O (5.43 mL) and heated to 80 °C. After stirring for 4 hrs, the reaction was poured into H<sub>2</sub>O (50 mL) and



-179-

extracted with EtOAc (30 mL x 2). The EtOAc was dried over MgSO<sub>4</sub> and concentrated under vacuum. The residue was dissolved in dichloromethane (25 mL), and Br<sub>2</sub> (282  $\mu$ L, 5.5 mmol) in dichloromethane (3 mL) was added dropwise for 5 min at 0 °C. After addition of Br<sub>2</sub>, the reaction mixture was warmed to room temperature and stirred for 2 hrs. The reaction mixture was washed with H<sub>2</sub>O (20 mL), concentrated under vacuum and triturated in EtOH to afford yellowish crystals. A 5 mL round-bottom flask was charged with the solids and SnCl<sub>2</sub>·2H<sub>2</sub>O (4.12 g, 18.3 mmol) and dissolved in EtOH (20 mL). The mixture was refluxed for 1.5 hrs and cooled to room temperature. The reaction was concentrated under vacuum and extracted with EtOAc (20 mL x 2) and H<sub>2</sub>O (20 mL). The EtOAc was dried over MgSO<sub>4</sub>, concentrated under vacuum and purified over silica gel (EtOAc/Hex = 1/2, R<sub>F</sub> = 0.31) to afford Amino biaryl **16-5** as white crystals (1.31 g, 83 % in 3 steps).

[0447] In general, the coupling procedures disclosed herein between an amine, such as, Amino biaryls **16-5**, **16-5** and the like, with isocyanates, acid halides and sulfonyl halides can be utilized to achieve the desired urea, amide or sulfonamide products respectively. Analytical data for certain representative compounds, such as those compounds in TABLES 16-1 and 16-2, can be seen in TABLE 16-3 below:

**TABLE 16-3**  
Analytical Data for Representative Compounds  
of the Invention

Compound No.	Expected	Found (M+H <sup>79</sup> Br)	Found (M+H <sup>81</sup> Br)
185	520	520	522
186	545	545	547
187	545	545	547
191	511	511	513
192	495	495	497
196	502	502	504
198	507	507	509
200	557	557	559
201	519	519	521
202	517	517	519

20

[0448] An important point that can be derived from the foregoing data is that by using a constitutively activated form of the receptor in the direct identification of candidate compounds, the selectivity of the compounds is exceptional: as those in the art appreciate, the homology between the human 5-HT<sub>2A</sub> and 5-HT<sub>2C</sub> receptors is about 95%, and even with such homology, certain of the directly identified compounds, e.g., Compounds **8** and **9** evidence a 100-fold difference in selectivity preference (as measured by IC<sub>50</sub> values) for the 5-HT<sub>2A</sub> receptor compared with the 5-HT<sub>2C</sub> receptor.

25

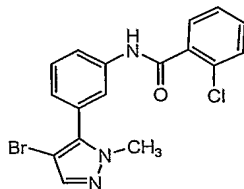
-180-

This is important for pharmaceutical compositions in that such selectivity can help to reduce side-effects associated with interaction of a drug with a non-target receptor.

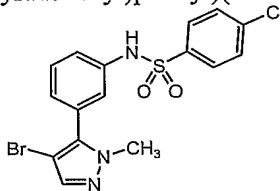
**[0449]** Different embodiments of the invention will consist of different constitutively activated receptors, different expression systems, different assays, and different compounds. Those skilled in the art will understand which receptors to use with which expression systems and assay methods. All are considered within the scope of the teaching of this invention.

**[0450]** In some embodiments of each of the genera disclosed in this specification, the following compounds (a) through (k), and combinations or subcombinations thereof, are included therein:

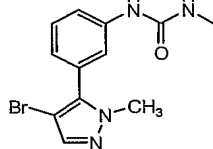
(a) N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)(2-chlorophenyl)carboxamide;



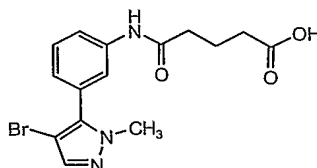
(b) N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)(4-chlorophenyl)sulfonamide;



(c) N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)(methylamino)carboxamide;

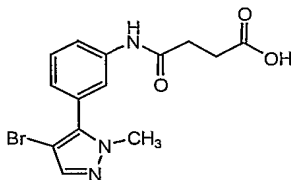


(d) N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)((3-carboxy-prop-1-yl)carboxamide;

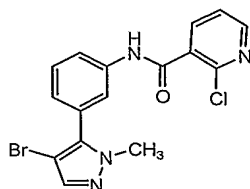


(e) N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)((2-carboxy-eth-1-yl)carboxamide;

-181-

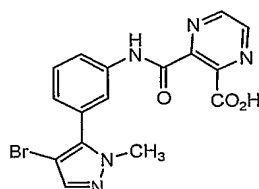


(f) N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)((2-chloro-3-pyridyl)carboxamide;



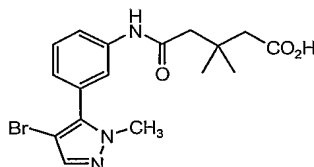
5

(g) N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)((3-carboxy-pyrazin-2-yl)carboxamide;

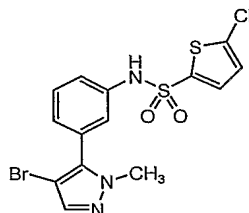


10

(h) N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)((2-methyl-1-carboxy-prop-2-yl)carboxamide;

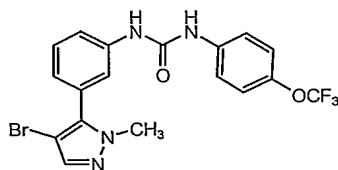


(i) N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)((5-chlorothiophen-2-yl)sulfonamide;



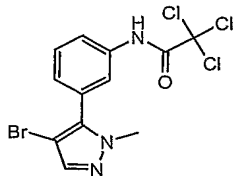
15

(j) N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)((4-trifluoromethoxy)phenyl) amino carboxamide;



-182-

(k) N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)(trichloromethyl)carboxamide.



5

[0451] In some embodiments of each of the general disclosed in this specification, compounds (a) through (k) above, and combinations or subcombinations thereof, are not included therein.

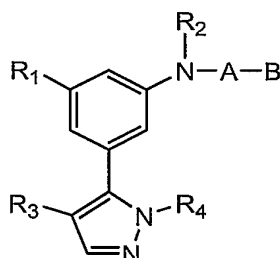
10. [0452] Those skilled in the art will recognize that various modifications, additions, substitutions, and variations to the illustrative examples set forth herein can be made without departing from the spirit of the invention and are, therefore, considered within the scope of the invention. All documents referenced above, including, but not limited to, printed publications, and provisional and regular patent applications, are incorporated herein by reference in their entirety. :

-183-

## CLAIMS

## We claim:

1. A compound of Formula (I):



(I)

wherein:

- i) R<sub>1</sub> is H, halogens, NR<sub>5</sub>R<sub>6</sub>, OH or OR<sub>7</sub>, wherein

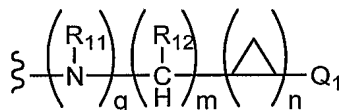
R<sub>5</sub> and R<sub>6</sub> are independently H, or C<sub>1-6</sub> alkyl, or C<sub>2-6</sub> alkenyl, or cycloalkyl, or aryl, or CH<sub>2</sub> aryl group and each said group may be optionally substituted by up to four substituents in any position independently selected from CF<sub>3</sub>, CCl<sub>3</sub>, Me, NO<sub>2</sub>, OH, OMe, OEt, CONR<sub>8</sub>R<sub>9</sub>, NR<sub>8</sub>R<sub>9</sub>, NHCOCH<sub>3</sub>, OCF<sub>3</sub>, SMe, COOR<sub>10</sub>, SO<sub>3</sub>R<sub>8</sub>, SO<sub>2</sub>NR<sub>8</sub>R<sub>9</sub>, COMe, COEt, CO-lower alkyl, SCF<sub>3</sub>, CN, C<sub>2-6</sub> alkenyl, H, halogens, C<sub>1-4</sub> alkoxy, C<sub>3-6</sub> cycloalkyl, C<sub>1-6</sub> alkyl, and aryl wherein each of the C<sub>3-6</sub> cycloalkyl, C<sub>1-6</sub> alkyl, or aryl groups may be further optionally substituted by up to four substituents in any position independently selected from CF<sub>3</sub>, CCl<sub>3</sub>, Me, NO<sub>2</sub>, OH, OMe, OEt, CONR<sub>8</sub>R<sub>9</sub>, NR<sub>8</sub>R<sub>9</sub>, NHCOCH<sub>3</sub>, OCF<sub>3</sub>, SMe, COOR<sub>10</sub>, SO<sub>2</sub>NR<sub>8</sub>R<sub>9</sub>, SO<sub>3</sub>R<sub>10</sub>, COMe, COEt, CO-lower alkyl, SCF<sub>3</sub>, CN, C<sub>2-6</sub> alkenyl, H, halogens, C<sub>1-4</sub> alkoxy, C<sub>3-6</sub> cycloalkyl, C<sub>1-6</sub> alkyl, and aryl; or

R<sub>5</sub> and R<sub>6</sub> may form part of a 5, 6 or 7 membered cyclic structure which may be either saturated or unsaturated and that may contain up to four heteroatoms selected from O, N or S and said cyclic structure may be optionally substituted by up to four substituents in any position independently selected from CF<sub>3</sub>, CCl<sub>3</sub>, Me, NO<sub>2</sub>, OH, OMe, OEt, OCF<sub>3</sub>, SMe, COOR<sub>10</sub>, SO<sub>2</sub>NR<sub>8</sub>R<sub>9</sub>, SO<sub>3</sub>R<sub>10</sub>, NHCOCH<sub>3</sub>, COEt, COMe, or halogen;

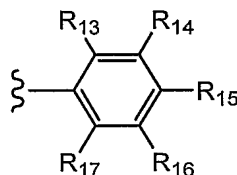
R<sub>8</sub> and R<sub>9</sub> are independently a H, or C<sub>1-6</sub> alkyl, or C<sub>2-6</sub> alkenyl, or cycloalkyl, or aryl, or CH<sub>2</sub> aryl group and each said group may be optionally substituted by up to four substituents in any position independently selected from halogen, CF<sub>3</sub>, OCF<sub>3</sub>, OEt, CCl<sub>3</sub>, Me, NO<sub>2</sub>, OH, OMe, SMe, COMe, CN, COOR<sub>10</sub>, SO<sub>3</sub>R<sub>10</sub>, COEt, NHCOCH<sub>3</sub>, or aryl;

-184-

- 25  $R_{10}$  is H or  $C_{1-6}$  alkyl;  
 26  $R_7$  is H or  $C_{1-6}$  alkyl;  
 27 ii)  $R_2$  is H, straight chain or branched  $C_{1-6}$  alkyl,  $C_{2-6}$  alkenyl, or cycloalkyl;  
 28 iii)  $R_3$  is halogen, carboxy, CN, alkoxy carbonyl, straight chain or branched  $C_{1-6}$  alkyl,  $C_{2-6}$   
 29 alkenyl,  $C_{2-6}$  alkynyl, cycloalkyl, aryl or heteroaryl, wherein each of said alkoxy carbonyl, straight  
 30 chain or branched  $C_{1-6}$  alkyl,  $C_{2-6}$  alkenyl,  $C_{2-6}$  alkynyl, cycloalkyl, aryl or heteroaryl groups can  
 31 be optionally substituted with up to four substituents in any position selected from OH,  $OR_{10}$ ,  
 32  $NR_8R_9$ , halogen,  $-C(p)_3$ , or  $-O-C(p)_3$  where p is halogen, and said cycloalkyl, aryl or heteroaryl  
 33 groups can alternatively or additionally be optionally substituted with up to four alkyl substituents  
 34 in any position;  
 35 iv)  $R_4$  is  $C_{1-6}$  alkyl,  $C_{2-6}$  alkenyl, or cycloalkyl;  
 36 v) A is  $C(=O)$ ,  $C(=S)$  or  $SO_2$ ;  
 37 vi) B is  $L_1$  or  $L_2$ ;  
 38  $L_1$  is:



- 39  
 40 q is 0 or 1;  
 41 m is 0 or 1;  
 42 n is 0 or 1;  
 43  $R_{11}$  and  $R_{12}$  are each independently H, straight chain or  
 44 branched  $C_{1-6}$  alkyl,  $C_{2-6}$  alkenyl, or cycloalkyl;  
 45  $Q_1$  is:



46  
 47 wherein:

- 48  $R_{13}$ ,  $R_{14}$ ,  $R_{15}$ ,  $R_{16}$  and  $R_{17}$  are each independently H, halogen, CN,  $NR_8R_9$ ,  
 49  $COOR_{10}$ ,  $SR_{10}$ , straight chain or branched  $C_{1-6}$  alkyl,  $C_{2-6}$  alkenyl,  $C_{2-6}$  alkynyl,  
 50 cycloalkyl, aryl, alkylaryl, arylalkyl or heteroaryl, wherein each of said  
 51 alkoxy carbonyl, straight chain or branched  $C_{1-6}$  alkyl,  $C_{2-6}$  alkenyl,  $C_{2-6}$  alkynyl,  
 52 cycloalkyl, aryl, alkylaryl, arylalkyl or heteroaryl groups can be optionally  
 53 substituted with up to four substituents in any position selected from  $NO_2$ ,  $OR_{10}$ ,

-185-

54 NR<sub>8</sub>R<sub>9</sub>, halogen, -C(p)<sub>3</sub>, or -O-C(p)<sub>3</sub> where p is halogen, and said cycloalkyl, aryl,  
55 alkylaryl, arylalkyl or heteroaryl groups can alternatively or additionally be  
56 optionally substituted with up to four alkyl substituents in any position;  
57

58 L<sub>2</sub> is -O-Q<sub>2</sub> wherein Q<sub>2</sub> is straight chain or branched C<sub>1-6</sub> alkyl,  
59 C<sub>2-6</sub> alkenyl, C<sub>2-6</sub> alkynyl, cycloalkyl, aryl, alkylaryl, arylalkyl, wherein each of said  
60 cycloalkyl, aryl, alkylaryl, or arylalkyl groups can be optionally substituted with up to  
61 four substituents in any position selected from NO<sub>2</sub>, OR<sub>7</sub>, halogen, -C(p)<sub>3</sub>, or -O-C(p)<sub>3</sub>  
62 where p is halogen, or an aliphatic or aromatic heterocycle, and said cycloalkyl, aryl,  
63 alkylaryl, and arylalkyl groups can alternatively or additionally be optionally substituted  
64 with up to four alkyl substituents in any position; or  
65 a pharmaceutically acceptable salt.

1 2. The compound of claim 1 wherein B is L<sub>1</sub>, q is 1, m is 0, and n is 0.

1 3. The compound of claim 1 wherein B is L<sub>1</sub>, q is 1, m is 1, and n is 0.

1 4. The compound of claim 1 wherein B is L<sub>1</sub>, q is 1, m is 0, and n is 1.

1 5. The compound of claim 1 wherein B is L<sub>1</sub>, q is 0, m is 0, and n is 0.

1 6. The compound of claim 1 wherein B is L<sub>2</sub>.

1 7. The compound of claim 2 wherein A is C(=O).

1 8. The compound of claim 3 wherein A is C(=O).

1 9. The compound of claim 4 wherein A is C(=O).

1 10. The compound of claim 5 wherein A is C(=O).

1 11. The compound of claim 2 wherein A is C(=S).

-186-

- 1 12. The compound of claim 3 wherein A is C(=S).
- 1 13. The compound of claim 4 wherein A is C(=S).
- 1 14. The compound of claim 5 wherein A is C(=S).
- 1 15. The compound of claim 5 wherein A is SO<sub>2</sub>.
- 1 16. The compound of claim 1 wherein R<sub>1</sub> is H, Cl, F, dimethylamino, pyrrolidin-1-yl, morpholin-1-  
2 yl, 4-methylpiperazin-1-yl, OH or OCH<sub>3</sub>.
- 1 17. The compound of claim 1 wherein R<sub>3</sub> is Cl, Br, I, -COOCH<sub>3</sub>, 2-hydroxyethyl, 2-  
2 (dimethylamino)ethyl, vinyl, ethyl, phenyl, 4-methoxyphenyl, 3-methoxyphenyl, 4-fluorophenyl,  
3 4-trifluoromethoxyphenyl, thiophenyl, carboxy, cyclopropyl, -CCH, -CH=CH-CCH, or CN.
- 1 18. The compound of claim 7 wherein R<sub>1</sub> is H, Cl, F, dimethylamino, pyrrolidin-1-yl, morpholin-1-  
2 yl, 4-methylpiperazin-1-yl, OH or OCH<sub>3</sub>.
- 1 19. The compound of claim 7 wherein R<sub>3</sub> is Cl, Br, I, -COOCH<sub>3</sub>, 2-hydroxyethyl, 2-  
2 (dimethylamino)ethyl, vinyl, ethyl, phenyl, 4-methoxyphenyl, 3-methoxyphenyl, 4-fluorophenyl,  
3 4-trifluoromethoxyphenyl, thiophenyl, carboxy, cyclopropyl, -CCH, -CH=CH-CCH, or CN.
- 1 20. The compound of claim 8 wherein R<sub>1</sub> is H, Cl, F, dimethylamino, pyrrolidin-1-yl, morpholin-1-  
2 yl, 4-methylpiperazin-1-yl, OH or OCH<sub>3</sub>.
- 1 21. The compound of claim 8 wherein R<sub>3</sub> is Cl, Br, I, -COOCH<sub>3</sub>, 2-hydroxyethyl, 2-  
2 (dimethylamino)ethyl, vinyl, ethyl, phenyl, 4-methoxyphenyl, 3-methoxyphenyl, 4-fluorophenyl,  
3 4-trifluoromethoxyphenyl, thiophenyl, carboxy, cyclopropyl, -CCH, -CH=CH-CCH, or CN.
- 1 22. The compound of claim 9 wherein R<sub>1</sub> is H, Cl, F, dimethylamino, pyrrolidin-1-yl, morpholin-1-  
2 yl, 4-methylpiperazin-1-yl, OH or OCH<sub>3</sub>.



-187-

- 1 23. The compound of claim 9 wherein R<sub>3</sub> is Cl, Br, I, -COOCH<sub>3</sub>, 2-hydroxyethyl, 2-  
2 (dimethylamino)ethyl, vinyl, ethyl, phenyl, 4-methoxyphenyl, 3-methoxyphenyl, 4-fluorophenyl,  
3 4-trifluoromethoxyphenyl, thiophenyl, carboxy, cyclopropyl, -CCH, -CH=CH-CCH, or CN.
- 1 24. The compound of claim 1 wherein R<sub>2</sub> is H and R<sub>4</sub> is methyl.
- 1 25. The compound of claim 16 wherein R<sub>2</sub> is H and R<sub>4</sub> is methyl.
- 1 26. The compound of claim 17 wherein R<sub>2</sub> is H and R<sub>4</sub> is methyl.
- 1 27. The compound of claim 18 wherein R<sub>2</sub> is H and R<sub>4</sub> is methyl.
- 1 28. The compound of claim 19 wherein R<sub>2</sub> is H and R<sub>4</sub> is methyl.
- 1 29. The compound of claim 20 wherein R<sub>2</sub> is H and R<sub>4</sub> is methyl.
- 1 30. The compound of claim 21 wherein R<sub>2</sub> is H and R<sub>4</sub> is methyl.
- 1 31. The compound of claim 22 wherein R<sub>2</sub> is H and R<sub>4</sub> is methyl.
- 1 32. The compound of claim 23 wherein R<sub>2</sub> is H and R<sub>4</sub> is methyl.
- 1 33. The compound of any of claims 25 through 32 wherein R<sub>13</sub>, R<sub>14</sub>, R<sub>15</sub>, R<sub>16</sub> and R<sub>17</sub> are each  
2 independently H, F, Cl, Br, CN, dimethylamino, ethoxycarbonyl, methylthio, methyl, ethyl,  
3 isopropyl, trifluoromethyl, trifluoromethoxy, methoxy, NH<sub>2</sub> or NO<sub>2</sub>.
- 1 34. The compound of claim 15 wherein R<sub>2</sub> is H and R<sub>4</sub> is methyl.
- 1 35. The compound of claim 34 wherein R<sub>3</sub> is Cl, Br, I, -COOCH<sub>3</sub>, 2-hydroxyethyl, 2-  
2 (dimethylamino)ethyl, vinyl, ethyl, phenyl, 4-methoxyphenyl, 3-methoxyphenyl, 4-fluorophenyl,  
3 4-trifluoromethoxyphenyl, thiophenyl, carboxy, cyclopropyl, -CCH, -CH=CH-CCH, or CN.
- 1 36. The compound of claim 6 wherein A is (C=O).

- 1 37. The compound of claim 36 wherein R<sub>4</sub> is methyl.
- 1 38. The compound of claim 37 wherein R<sub>2</sub> is H.
- 1 39. The compound of claim 38 wherein Q<sub>1</sub> is ethyl, 4-nitrophenyl, allyl, 4-methylphenyl, isopropyl,  
2 butyl, 2-isopropyl-5-methylcyclohexyl, benzyl, 3-bromophenyl, 4-fluorophenyl, 2-  
3 methoxyphenyl, 2-chlorophenyl, -C(CH<sub>3</sub>)=CH, 1-(N-pyridyl)ethyl, or 9-fluorenylmethyl.
- 1 40. The compound of claim 39 wherein R<sub>1</sub> is H, Cl, F, dimethylamino, pyrrolidin-1-yl, morpholin-1-  
2 yl, 4-methylpiperazin-1-yl, OH or OCH<sub>3</sub>; and R<sub>3</sub> is Cl, Br, I, -COOCH<sub>3</sub>, 2-hydroxyethyl, 2-  
3 (dimethylamino)ethyl, vinyl, ethyl, phenyl, 4-methoxyphenyl, 3-methoxyphenyl, 4-fluorophenyl,  
4 4-trifluoromethoxyphenyl, thiophenyl, carboxy, cyclopropyl, -CCH, -CH=CH-CCH, or CN.
- 1 41. A compound of claim 1 selected from the group consisting of  
2 1-[3-(4-Chloro-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(4-chloro-phenyl)-urea;  
3 1-[3-Chloro-5-(4-chloro-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(4-chloro-phenyl)-urea;  
4 1-[3-(4-Chloro-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(2,4-dichloro-phenyl)-urea;  
5 1-[3-(4-Chloro-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(1-phenyl-ethyl)-urea;  
6 1-[3-(4-Chloro-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(4-cyano-phenyl)-urea;  
7 1-[3-(4-Chloro-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(4-dimethylamino-phenyl)-urea;  
8 4-{3-[3-(4-Chloro-2-methyl-2H-pyrazol-3-yl)-phenyl]-ureido}-benzoic acid ethyl ester;  
9 1-[3-(4-Chloro-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(4-methylsulfanyl-phenyl)-urea;  
10 1-[3-(4-Chloro-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(4-isopropyl-phenyl)-urea;  
11 1-(4-Chloro-phenyl)-3-[3-(4-iodo-2-methyl-2H-pyrazol-3-yl)-phenyl]-urea;  
12 [3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-carbamic acid ethyl ester;  
13 [3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-carbamic acid 4-nitro-phenyl ester;  
14 [3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-carbamic acid 9H-fluoren-9-ylmethyl  
15 ester;  
16 [3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-carbamic acid allyl ester;  
17 [3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-carbamic acid p-tolyl ester;  
18 [3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-carbamic acid butyl ester;

- 19 [3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-carbamic acid 2-isopropyl-5-methyl-  
20 cyclohexyl ester;  
21 [3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-carbamic acid benzyl ester;  
22 [3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-carbamic acid 3-trifluoromethyl-phenyl  
23 ester;  
24 [3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-carbamic acid 4-bromo-phenyl ester;  
25 [3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-carbamic acid 4-fluoro-phenyl ester;  
26 [3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-carbamic acid 2-methoxy-phenyl ester;  
27 [3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-carbamic acid 2-chloro-phenyl ester;  
28 [3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-carbamic acid isopropenyl ester;  
29 [3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-carbamic acid 1-pyridin-1-yl-ethyl  
30 ester;  
31 [3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-carbamic acid isopropyl ester;  
32 5-{3-[3-(4-Chloro-phenyl)-ureido]-phenyl}-1-methyl-1H-pyrazole-4-carboxylic acid  
33 methyl ester;  
34 1-(4-Fluoro-phenyl)-3-{3-[4-(2-hydroxy-ethyl)-2-methyl-2H-pyrazol-3-yl]-phenyl}-urea;  
35 1-{3-[4-(2-Dimethylamino-ethyl)-2-methyl-2H-pyrazol-3-yl]-phenyl}-3-(4-fluoro-  
36 phenyl)-urea;  
37 1-(4-Chloro-phenyl)-3-[3-(2-methyl-4-vinyl-2H-pyrazol-3-yl)-phenyl]-urea;  
38 1-(4-Chloro-phenyl)-3-[3-(4-ethyl-2-methyl-2H-pyrazol-3-yl)-phenyl]-urea;  
39 1-(4-Fluoro-phenyl)-3-[3-(2-methyl-4-vinyl-2H-pyrazol-3-yl)-phenyl]-urea;  
40 1-(4-Chloro-phenyl)-3-[3-(2-methyl-4-phenyl-2H-pyrazol-3-yl)-phenyl]-urea;  
41 1-(4-Chloro-phenyl)-3-{3-[4-(4-methoxy-phenyl)-2-methyl-2H-pyrazol-3-yl]-phenyl}-  
42 urea;  
43 1-(4-Chloro-phenyl)-3-{3-[4-(3-methoxy-phenyl)-2-methyl-2H-pyrazol-3-yl]-phenyl}-  
44 urea;  
45 1-(4-Chloro-phenyl)-3-{3-[4-(4-fluoro-phenyl)-2-methyl-2H-pyrazol-3-yl]-phenyl}-urea;  
46 1-(4-Chloro-phenyl)-3-{3-[2-methyl-4-(4-trifluoromethoxy-phenyl)-2H-pyrazol-3-yl]-  
47 phenyl}-urea;  
48 1-(4-Chloro-phenyl)-3-[3-(2-methyl-4-thiophen-2-yl-2H-pyrazol-3-yl)-phenyl]-urea;  
49 5-{3-[3-(4-Chloro-phenyl)-ureido]-phenyl}-1-methyl-1H-pyrazole-4-carboxylic acid;  
50 1-[3-(4-Cyclopropyl-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(3-trifluoromethyl-phenyl)-  
51 urea;

- 52 1-(3-Chloro-phenyl)-3-[3-(4-cyclopropyl-2-methyl-2H-pyrazol-3-yl)-phenyl]-urea;  
53 1-[3-(4-Cyclopropyl-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(2-methoxy-phenyl)-urea;  
54 1-(4-Chloro-phenyl)-3-[3-(4-ethynyl-2-methyl-2H-pyrazol-3-yl)-phenyl]-urea;  
55 1-[3-(4-But-1-en-3-ynyl-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(4-chloro-phenyl)-urea;  
56 1-[3-(4-But-1-en-3-ynyl-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-p-tolyl-urea;  
57 1-(4-Chloro-phenyl)-3-[3-(4-cyano-2-methyl-2H-pyrazol-3-yl)-phenyl]-urea;  
58 1-[3-(4-Cyano-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(4-isopropyl-phenyl)-urea;  
59 1-[3-(4-Cyclopropyl-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(4-fluoro-phenyl)-urea;  
60 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-fluoro-phenyl]-3-(4-chloro-phenyl)-urea;  
61 N-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-fluoro-phenyl]-4-fluoro-  
62 benzenesulfonamide;  
63 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-fluoro-phenyl]-3-(4-bromo-phenyl)-urea;  
64 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-fluoro-phenyl]-3-(4-isopropyl-phenyl)-urea;  
65 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-fluoro-phenyl]-3-(4-fluoro-phenyl)-urea;  
66 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-fluoro-phenyl]-3-(4-methoxy-phenyl)-urea;  
67 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-fluoro-phenyl]-3-(4-cyano-phenyl)-urea;  
68 N-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-fluoro-phenyl]-4-chloro-  
69 benzenesulfonamide;  
70 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-fluoro-phenyl]-3-(2,4-dichloro-phenyl)-  
71 urea;  
72 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-dimethylamino-phenyl]-3-(4-bromo-  
73 phenyl)-urea;  
74 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-pyrrolidin-1-yl-phenyl]-3-(1-phenyl-ethyl)-  
75 urea;  
76 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-morpholin-4-yl-phenyl]-3-(2,4-dichloro-  
77 phenyl)-urea;  
78 N-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-pyrrolidin-1-yl-phenyl]-benzamide;  
79 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-pyrrolidin-1-yl-phenyl]-3-(4-bromo-  
80 phenyl)-urea;  
81 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-pyrrolidin-1-yl-phenyl]-3-(4-  
82 dimethylamino-phenyl)-urea;  
83 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-morpholin-4-yl-phenyl]-3-(4-isopropyl-  
84 phenyl)-urea;

-191-

1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-(4-methyl-piperazin-1-yl)-phenyl]-3-(4-bromo-phenyl)-urea;

1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-dimethylamino-phenyl]-3-(4-chloro-phenyl)-urea;

1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-(4-methyl-piperazin-1-yl)-phenyl]-3-(2-trifluoromethoxy-phenyl)-urea;

1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-pyrrolidin-1-yl-phenyl]-3-(4-methoxy-phenyl)-thiourea;

1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-(4-methyl-piperazin-1-yl)-phenyl]-3-(4-isopropyl-phenyl)-urea;

1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-(4-methyl-piperazin-1-yl)-phenyl]-3-(4-chloro-phenyl)-urea;

N-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-pyrrolidin-1-yl-phenyl]-4-fluoro-benzenesulfonamide;

N-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-dimethylamino-phenyl]-4-chloro-benzenesulfonamide;

1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-morpholin-4-yl-phenyl]-3-(4-fluoro-phenyl)-urea;

1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-morpholin-4-yl-phenyl]-3-(4-chloro-phenyl)-urea;

1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-pyrrolidin-1-yl-phenyl]-3-(2,4-dichloro-phenyl)-urea;

1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-dimethylamino-phenyl]-3-(4-dimethylamino-phenyl)-urea;

1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-(4-methyl-piperazin-1-yl)-phenyl]-3-(4-fluoro-phenyl)-urea;

1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-pyrrolidin-1-yl-phenyl]-3-(4-methoxy-phenyl)-urea;

1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-morpholin-4-yl-phenyl]-3-(2-phenyl-cyclopropyl)-urea;

1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-(4-methyl-piperazin-1-yl)-phenyl]-3-(4-cyano-phenyl)-urea;

-192-

- 117 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-morpholin-4-yl-phenyl]-3-(4-cyano-phenyl)-  
118 urea;
- 119 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-dimethylamino-phenyl]-3-(4-fluoro-phenyl)-  
120 urea;
- 121 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-dimethylamino-phenyl]-3-(4-isopropyl-  
122 phenyl)-urea;
- 123 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-pyrrolidin-1-yl-phenyl]-3-(4-fluoro-phenyl)-  
124 urea;
- 125 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-(4-methyl-piperazin-1-yl)-phenyl]-3-(2-  
126 phenyl-cyclopropyl)-urea;
- 127 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-(4-methyl-piperazin-1-yl)-phenyl]-3-(2,4-  
128 dichloro-phenyl)-urea;
- 129 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-morpholin-4-yl-phenyl]-3-(4-  
130 trifluoromethyl-phenyl)-urea;
- 131 1-(3-Amino-4-fluoro-phenyl)-3-[3-(4-bromo-2-methyl-2H-pyrazol-3-yl)-5-pyrrolidin-1-  
132 yl-phenyl]-urea;
- 133 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-dimethylamino-phenyl]-3-(4-methoxy-  
134 phenyl)-urea;
- 135 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-pyrrolidin-1-yl-phenyl]-3-(4-fluoro-3-nitro-  
136 phenyl)-urea;
- 137 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-dimethylamino-phenyl]-3-(4-cyano-phenyl)-  
138 urea;
- 139 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-pyrrolidin-1-yl-phenyl]-3-(1-phenyl-ethyl)-  
140 urea;
- 141 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-pyrrolidin-1-yl-phenyl]-3-(2-phenyl-  
142 cyclopropyl)-urea;
- 143 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-pyrrolidin-1-yl-phenyl]-3-(4-chloro-phenyl)-  
144 urea;
- 145 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-morpholin-4-yl-phenyl]-3-(4-bromo-  
146 phenyl)-urea;
- 147 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-pyrrolidin-1-yl-phenyl]-3-(4-cyano-phenyl)-  
148 urea;

-193-

149 N-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-dimethylamino-phenyl]-4-fluoro-  
150 benzenesulfonamide;  
151 N-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-pyrrolidin-1-yl-phenyl]-  
152 benzenesulfonamide;  
153 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-morpholin-4-yl-phenyl]-3-(4-methoxy-  
154 phenyl)-urea;  
155 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-(4-methyl-piperazin-1-yl)-phenyl]-3-(4-  
156 dimethylamino-phenyl)-urea;  
157 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-pyrrolidin-1-yl-phenyl]-3-(4-isopropyl-  
158 phenyl)-urea;  
159 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-methoxy-phenyl]-3-(4-fluoro-phenyl)-urea;  
160 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-hydroxy-phenyl]-3-(3,5-dichloro-phenyl)-  
161 urea;  
162 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-hydroxy-phenyl]-3-(4-fluoro-phenyl)-urea;  
163 N-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-methoxy-phenyl]-4-chloro-  
164 benzenesulfonamide;  
165 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-methoxy-phenyl]-3-(4-dimethylamino-  
166 phenyl)-urea;  
167 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-methoxy-phenyl]-3-(4-bromo-phenyl)-urea;  
168 N-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-hydroxy-phenyl]-4-chloro-  
169 benzenesulfonamide;  
170 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-methoxy-phenyl]-3-(3,5-dichloro-phenyl)-  
171 urea;  
172 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-hydroxy-phenyl]-3-(4-chloro-phenyl)-urea;  
173 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-methoxy-phenyl]-3-(4-chloro-phenyl)-urea;  
174 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-methoxy-phenyl]-3-(2,4-dichloro-phenyl)-  
175 urea;  
176 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-pyrrolidin-1-yl-phenyl]-3-(4-  
177 trifluoromethyl-phenyl)-urea;  
178 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-hydroxy-phenyl]-3-(4-methoxy-phenyl)-  
179 urea;  
180 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-methoxy-phenyl]-3-(4-methoxy-phenyl)-  
181 urea;

-194-

182 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-hydroxy-phenyl]-3-(4-cyano-phenyl)-urea  
 183 and  
 184 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(4-chloro-phenyl)-thiourea.

1 42. A compound of claim 1 selected from the group consisting of:  
 2 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(3,4-difluoro-phenyl)-urea;  
 3 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(2,5-difluoro-phenyl)-urea;  
 4 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(3,5-difluoro-phenyl)-urea;  
 5 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(3-chloro-4-fluoro-phenyl)-urea;  
 6 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(4-fluoro-2-trifluoromethyl-  
 7 phenyl)-urea;  
 8 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(4-fluoro-3-trifluoromethyl-  
 9 phenyl)-urea;  
 10 1-[3-(4-Chloro-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(2,5-difluoro-phenyl)-urea;  
 11 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(2,3,4-trifluoro-phenyl)-urea;  
 12 1-[3-(4-Chloro-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(3,5-difluoro-phenyl)-urea;  
 13 1-(3-Chloro-4-fluoro-phenyl)-3-[3-(4-chloro-2-methyl-2H-pyrazol-3-yl)-phenyl]-urea;  
 14 1-[3-(4-Chloro-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(2,4-difluoro-phenyl)-urea;  
 15 1-[3-(4-Chloro-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(2,3,4-trifluoro-phenyl)-urea;  
 16 1-[3-(4-Chloro-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(4-fluoro-2-trifluoromethyl-  
 17 phenyl)-urea;  
 18 1-[3-(4-Chloro-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(4-chloro-2-trifluoromethyl-  
 19 phenyl)-urea;  
 20 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(4-chloro-3-trifluoromethyl-  
 21 phenyl)-urea  
 22 and  
 23 1-[3-(4-Chloro-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(4-fluoro-3-trifluoromethyl-phenyl)-urea.

1 43. The compound of claim 1 selected from the group consisting of:  
 2 N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)(4-methoxyphenoxy)carboxamide;  
 3 N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)(2-thienyl)carboxamide;  
 4 N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)((4-trifluoromethoxy)  
 5 phenyl)amino)carboxamide;



6 N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)((4-trifluoromethoxy)  
7 phenyl)methyl)amino)carboxamide;  
8 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(1,1-dimethylethoxy)carboxamide;  
9 N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)(4-trifluoromethoxyphenyl) carboxamide;  
10 N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)(4-chlorophenyl) carboxamide;  
11 N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)-2-(4-(trifluoromethoxy) phenyl)acetamide;  
12 N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)-2-(3-fluorophenyl) acetamide;  
13 N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)-2-(3-methoxyphenyl) acetamide;  
14 N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)-2-(2-fluorophenyl) acetamide;  
15 N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)-2-(4-nitrophenyl)acetamide;  
16 N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)-2-(2-methoxyphenyl) acetamide;  
17 N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)((4-methylthiophenyl)amino) carboxamide;  
18 N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)((4-chlorophenyl)amino) carboxamide;  
19 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(4-fluorophenyl) carboxamide;  
20 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(2-  
21 (trifluoromethoxy)phenyl)carboxamide;  
22 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(2-nitrophenyl) carboxamide;  
23 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(4-methoxyphenyl) carboxamide;  
24 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(2-methylphenyl) carboxamide;  
25 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(4-(trifluoromethyl)  
26 phenyl)carboxamide;  
27 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(3-chlorophenyl) carboxamide;  
28 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(2-chlorophenyl) carboxamide;  
29 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(4-(methylethyl)  
30 phenyl)carboxamide;  
31 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(3-methoxyphenyl) carboxamide;  
32 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(3-methylphenyl) carboxamide;  
33 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-methyl-N-(4-  
34 (trifluoromethoxy)phenyl)-carboxamide;  
35 N-(4-(tert-butyl)phenyl)((3-(4-bromo-2-methylpyrazol-3-yl)phenyl) amino)carboxamide;  
36 N-(4-(dimethylamino)phenyl)((3-(4-bromo-2-methylpyrazol-3-  
37 yl)phenyl)amino)carboxamide;

-196-

38 N-(3,5-dichloro-4-methylphenyl)((3-(4-bromo-2-methylpyrazol-3-  
 39 yl)phenyl)amino)carboxamide;  
 40 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(4-  
 41 (trifluoromethylthio)phenyl)carboxamide;  
 42 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(cyclohexyl) carboxamide;  
 43 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(phenylmethyl) carboxamide;  
 44 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(2-fluorophenyl) carboxamide;  
 45 2-(((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)-amino)carbonylamino) benzamide;  
 46 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(4-cyanophenyl) carboxamide;  
 47 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(2-cyanophenyl) carboxamide;  
 48 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(4-  
 49 fluorophenylmethyl)carboxamide;  
 50 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(3,4-  
 51 dimethoxyphenylmethyl)carboxamide;  
 52 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(3,4,5-  
 53 trimethoxyphenylmethyl)carboxamide;  
 54 N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)-(((2-methylphenyl)methyl)  
 55 amino)carboxamide;  
 56 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(4-  
 57 methoxyphenylmethyl)carboxamide  
 58 and  
 59 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(2-(4-methoxy)phenylethyl)carboxamide.

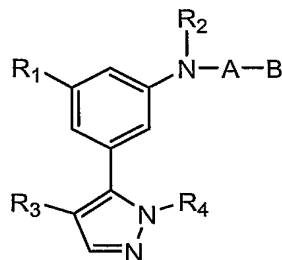
1 44. The compound of claim 1 selected from the group consisting of:  
 2 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(2-chloro-4-trifluoromethyl-  
 3 phenyl)-urea;  
 4 1-(3,4-Bis-trifluoromethyl-phenyl)-3-[3-(4-bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-  
 5 urea;  
 6 3-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-1-(4-fluoro-phenyl)-1-methyl-urea;  
 7 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(3-fluoro-4-trifluoromethyl-  
 8 phenyl)-urea;  
 9 3-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-1-(4-chloro-phenyl)-1-methyl-urea;  
 10 3-[3-(4-Chloro-2-methyl-2H-pyrazol-3-yl)-phenyl]-1-(4-chloro-phenyl)-1-methyl-urea

-197-

and

3-[3-(4-Chloro-2-methyl-2H-pyrazol-3-yl)-phenyl]-1-(4-fluoro-phenyl)-1-methyl-urea.

45. A compound of Formula (I):



(I)

wherein:

i) R<sub>1</sub> is H, halogens, NR<sub>5</sub>R<sub>6</sub>, OH or OR<sub>7</sub>, wherein

R<sub>5</sub> and R<sub>6</sub> are independently H, or C<sub>1-6</sub> alkyl, or C<sub>2-6</sub> alkenyl, or cycloalkyl, or aryl, or CH<sub>2</sub> aryl group and each said group may be optionally substituted by up to four substituents in any position independently selected from CF<sub>3</sub>, CCl<sub>3</sub>, Me, NO<sub>2</sub>, OH, OMe, OEt, CONR<sub>8</sub>R<sub>9</sub>, NR<sub>8</sub>R<sub>9</sub>, NHCOCH<sub>3</sub>, OCF<sub>3</sub>, SMe, COOR<sub>10</sub>, SO<sub>3</sub>R<sub>8</sub>, SO<sub>2</sub>NR<sub>8</sub>R<sub>9</sub>, COMe, COEt, CO-lower alkyl, SCF<sub>3</sub>, CN, C<sub>2-6</sub> alkenyl, H, halogens, C<sub>1-4</sub> alkoxy, C<sub>3-6</sub> cycloalkyl, C<sub>1-6</sub> alkyl, and aryl wherein each of the C<sub>3-6</sub> cycloalkyl, C<sub>1-6</sub> alkyl, or aryl groups may be further optionally substituted by up to four substituents in any position independently selected from CF<sub>3</sub>, CCl<sub>3</sub>, Me, NO<sub>2</sub>, OH, OMe, OEt, CONR<sub>8</sub>R<sub>9</sub>, NR<sub>8</sub>R<sub>9</sub>, NHCOCH<sub>3</sub>, OCF<sub>3</sub>, SMe, COOR<sub>10</sub>, SO<sub>2</sub>NR<sub>8</sub>R<sub>9</sub>, SO<sub>3</sub>R<sub>10</sub>, COMe, COEt, CO-lower alkyl, SCF<sub>3</sub>, CN, C<sub>2-6</sub> alkenyl, H, halogens, C<sub>1-4</sub> alkoxy, C<sub>3-6</sub> cycloalkyl, C<sub>1-6</sub> alkyl, and aryl; or

R<sub>5</sub> and R<sub>6</sub> may form part of a 5, 6 or 7 membered cyclic structure which may be either saturated or unsaturated and that may contain up to four heteroatoms selected from O, N or S and said cyclic structure may be optionally substituted by up to four substituents in any position independently selected from CF<sub>3</sub>, CCl<sub>3</sub>, Me, NO<sub>2</sub>, OH, OMe, OEt, OCF<sub>3</sub>, SMe, COOR<sub>10</sub>, SO<sub>2</sub>NR<sub>8</sub>R<sub>9</sub>, SO<sub>3</sub>R<sub>10</sub>, NHCOCH<sub>3</sub>, COEt, COMe, or halogen;

R<sub>8</sub> and R<sub>9</sub> are independently a H, or C<sub>1-6</sub> alkyl, or C<sub>2-6</sub> alkenyl, or cycloalkyl, or aryl, or CH<sub>2</sub> aryl group and each said group may be optionally substituted by up to four substituents in any position independently selected from halogen, CF<sub>3</sub>, OCF<sub>3</sub>, OEt, CCl<sub>3</sub>, Me, NO<sub>2</sub>, OH, OMe, SMe, COMe, CN, COOR<sub>10</sub>, SO<sub>3</sub>R<sub>10</sub>, COEt, NHCOCH<sub>3</sub>, or aryl;

R<sub>10</sub> is H or C<sub>1-6</sub> alkyl;

-198-

R<sub>7</sub> is H or C<sub>1-6</sub> alkyl;

ii) R<sub>2</sub> is H, straight chain or branched C<sub>1-6</sub> alkyl, C<sub>2-6</sub> alkenyl, or cycloalkyl;

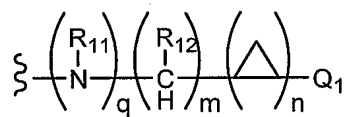
iii) R<sub>3</sub> is halogen, carboxy, CN, alkoxycarbonyl, straight chain or branched C<sub>1-6</sub> alkyl, C<sub>2-6</sub> alkenyl, C<sub>2-6</sub> alkynyl, cycloalkyl, aryl or heteroaryl, wherein each of said alkoxycarbonyl, straight chain or branched C<sub>1-6</sub> alkyl, C<sub>2-6</sub> alkenyl, C<sub>2-6</sub> alkynyl, cycloalkyl, aryl or heteroaryl groups can be optionally substituted with up to four substituents in any position selected from OH, OR<sub>10</sub>, NR<sub>8</sub>R<sub>9</sub>, halogen, -C(p)<sub>3</sub>, or -O-C(p)<sub>3</sub> where p is halogen, and said cycloalkyl, aryl or heteroaryl groups can alternatively or additionally be optionally substituted with up to four alkyl substituents in any position;

iv) R<sub>4</sub> is C<sub>1-6</sub> alkyl, C<sub>2-6</sub> alkenyl, or cycloalkyl;

v) A is C(=O), C(=S) or SO<sub>2</sub>;

vi) B is L<sub>1</sub> or L<sub>2</sub>;

L<sub>1</sub> is:



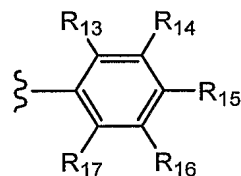
q is 0 or 1;

m is 0 or 1;

n is 0 or 1;

R<sub>11</sub> and R<sub>12</sub> are each independently H, straight chain or branched C<sub>1-6</sub> alkyl, C<sub>2-6</sub> alkenyl, or cycloalkyl;

Q<sub>1</sub> is:



wherein:

R<sub>13</sub>, R<sub>14</sub>, R<sub>15</sub>, R<sub>16</sub> and R<sub>17</sub> are each independently H, halogen, CN, NR<sub>8</sub>R<sub>9</sub>, COOR<sub>10</sub>, SR<sub>10</sub>, straight chain or branched C<sub>1-6</sub> alkyl, C<sub>2-6</sub> alkenyl, C<sub>2-6</sub> alkynyl, cycloalkyl, aryl, alkylaryl, arylalkyl or heteroaryl, wherein each of said alkoxycarbonyl, straight chain or branched C<sub>1-6</sub> alkyl, C<sub>2-6</sub> alkenyl, C<sub>2-6</sub> alkynyl, cycloalkyl, aryl, alkylaryl, arylalkyl or heteroaryl groups can be optionally substituted with up to four substituents in any position selected from NO<sub>2</sub>, OR<sub>10</sub>, NR<sub>8</sub>R<sub>9</sub>, halogen, -C(p)<sub>3</sub>, or -O-C(p)<sub>3</sub> where p is halogen, and said cycloalkyl, aryl,

-199-

55 alkylaryl, arylalkyl or heteroaryl groups can alternatively or additionally be  
56 optionally substituted with up to four alkyl substituents in any position;

57 L<sub>2</sub> is -O-Q<sub>2</sub> wherein Q<sub>2</sub> is straight chain or branched C<sub>1-6</sub> alkyl,  
58 C<sub>2-6</sub> alkenyl, C<sub>2-6</sub> alkynyl, cycloalkyl, aryl, alkylaryl, arylalkyl, wherein each of said  
59 cycloalkyl, aryl, alkylaryl, or arylalkyl groups can be optionally substituted with up to  
60 four substituents in any position selected from NO<sub>2</sub>, OR<sub>7</sub>, halogen, -C(p)<sub>3</sub>, or -O-C(p)<sub>3</sub>,  
61 where p is halogen, or an aliphatic or aromatic heterocycle, and said cycloalkyl, aryl,  
62 alkylaryl, and arylalkyl groups can alternatively or additionally be optionally substituted  
63 with up to four alkyl substituents in any position; or  
64 a pharmaceutically acceptable salt; provided that the compound is not any of the

65 following 43 compounds:

66 N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)(4-methoxyphenoxy)carboxamide;

67 N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)(2-thienyl)carboxamide;

68 N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)((4-trifluoromethoxy)

69 phenyl)amino)carboxamide;

70 N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)((4-trifluoromethoxy)

71 phenyl)methyl)amino)carboxamide;

72 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(1,1-dimethylethoxy)carboxamide;

73 N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)(4-trifluoromethoxyphenyl) carboxamide;

74 N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)(4-chlorophenyl) carboxamide;

75 N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)-2-(4-(trifluoromethoxy) phenyl)acetamide;

76 N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)-2-(3-fluorophenyl) acetamide;

77 N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)-2-(3-methoxyphenyl) acetamide;

78 N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)-2-(2-fluorophenyl) acetamide;

79 N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)-2-(4-nitrophenyl)acetamide;

80 N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)-2-(2-methoxyphenyl) acetamide;

81 N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)((4-methylthiophenyl)amino) carboxamide;

82 N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)((4-chlorophenyl)amino) carboxamide;

83 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(4-fluorophenyl) carboxamide;

84 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(2-

85 (trifluoromethoxy)phenyl)carboxamide;

86 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(2-nitrophenyl) carboxamide;

87 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(4-methoxyphenyl) carboxamide;

-200-

88 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(2-methylphenyl) carboxamide;  
89 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(4-(trifluoromethyl)  
90 phenyl)carboxamide;  
91 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(3-chlorophenyl) carboxamide;  
92 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(2-chlorophenyl) carboxamide;  
93 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(4-(methylethyl)  
94 phenyl)carboxamide;  
95 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(3-methoxyphenyl) carboxamide;  
96 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(3-methylphenyl) carboxamide;  
97 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-methyl-N-(4-  
98 (trifluoromethoxy)phenyl)-carboxamide;  
99 N-(4-(tert-butyl)phenyl)((3-(4-bromo-2-methylpyrazol-3-yl)phenyl) amino)carboxamide;  
100 N-(4-(dimethylamino)phenyl)((3-(4-bromo-2-methylpyrazol-3-  
101 yl)phenyl)amino)carboxamide;  
102 N-(3,5-dichloro-4-methylphenyl)((3-(4-bromo-2-methylpyrazol-3-  
103 yl)phenyl)amino)carboxamide;  
104 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(4-  
105 (trifluoromethylthio)phenyl)carboxamide;  
106 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(cyclohexyl) carboxamide;  
107 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(phenylmethyl) carboxamide;  
108 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(2-fluorophenyl) carboxamide;  
109 2-(((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)-amino)carbonylamino) benzamide;  
110 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(4-cyanophenyl) carboxamide;  
111 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(2-cyanophenyl) carboxamide;  
112 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(4-  
113 fluorophenylmethyl)carboxamide;  
114 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(3,4-  
115 dimethoxyphenylmethyl)carboxamide;  
116 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(3,4,5-  
117 trimethoxyphenylmethyl)carboxamide;  
118 N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)-(((2-methylphenyl)methyl)  
119 amino)carboxamide;

-201-

120 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(4-  
121 methoxyphenylmethyl)carboxamide  
122 and  
123 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(2-(4-methoxy)phenylethyl)carboxamide.

1 46. The compound of claim 45 wherein B is L<sub>1</sub>, q is 1, m is 0, and n is 0.

1 47. The compound of claim 45 wherein B is L<sub>1</sub>, q is 1, m is 1, and n is 0.

1 48. The compound of claim 45 wherein B is L<sub>1</sub>, q is 1, m is 0, and n is 1.

1 49. The compound of claim 45 wherein B is L<sub>1</sub>, q is 0, m is 0, and n is 0.

1 50. The compound of claim 45 wherein B is L<sub>2</sub>.

1 51. The compound of claim 46 wherein A is C(=O).

1 52. The compound of claim 47 wherein A is C(=O).

1 53. The compound of claim 48 wherein A is C(=O).

1 54. The compound of claim 49 wherein A is C(=O).

1 55. The compound of claim 46 wherein A is C(=S).

1 56. The compound of claim 47 wherein A is C(=S).

1 57. The compound of claim 48 wherein A is C(=S).

1 58. The compound of claim 49 wherein A is C(=S).

1 59. The compound of claim 49 wherein A is SO<sub>2</sub>.

-202-

- 1 60. The compound of claim 45 wherein R<sub>1</sub> is H, Cl, F, dimethylamino, pyrrolidin-1-yl, morpholin-1-  
2 yl, 4-methylpiperazin-1-yl, OH or OCH<sub>3</sub>.
- 1 61. The compound of claim 45 wherein R<sub>3</sub> is Cl, Br, I, -COOCH<sub>3</sub>, 2-hydroxyethyl, 2-  
2 (dimethylamino)ethyl, vinyl, ethyl, phenyl, 4-methoxyphenyl, 3-methoxyphenyl, 4-fluorophenyl,  
3 4-trifluoromethoxyphenyl, thiophenyl, carboxy, cyclopropyl, -CCH, -CH=CH-CCH, or CN.
- 1 62. The compound of claim 51 wherein R<sub>1</sub> is H, Cl, F, dimethylamino, pyrrolidin-1-yl, morpholin-1-  
2 yl, 4-methylpiperazin-1-yl, OH or OCH<sub>3</sub>.
- 1 63. The compound of claim 51 wherein R<sub>3</sub> is Cl, Br, I, -COOCH<sub>3</sub>, 2-hydroxyethyl, 2-  
2 (dimethylamino)ethyl, vinyl, ethyl, phenyl, 4-methoxyphenyl, 3-methoxyphenyl, 4-fluorophenyl,  
3 4-trifluoromethoxyphenyl, thiophenyl, carboxy, cyclopropyl, -CCH, -CH=CH-CCH, or CN.
- 1 64. The compound of claim 52 wherein R<sub>1</sub> is H, Cl, F, dimethylamino, pyrrolidin-1-yl, morpholin-1-  
2 yl, 4-methylpiperazin-1-yl, OH or OCH<sub>3</sub>.
- 1 65. The compound of claim 52 wherein R<sub>3</sub> is Cl, Br, I, -COOCH<sub>3</sub>, 2-hydroxyethyl, 2-  
2 (dimethylamino)ethyl, vinyl, ethyl, phenyl, 4-methoxyphenyl, 3-methoxyphenyl, 4-fluorophenyl,  
3 4-trifluoromethoxyphenyl, thiophenyl, carboxy, cyclopropyl, -CCH, -CH=CH-CCH, or CN.
- 1 66. The compound of claim 53 wherein R<sub>1</sub> is H, Cl, F, dimethylamino, pyrrolidin-1-yl, morpholin-1-  
2 yl, 4-methylpiperazin-1-yl, OH or OCH<sub>3</sub>.
- 1 67. The compound of claim 53 wherein R<sub>3</sub> is Cl, Br, I, -COOCH<sub>3</sub>, 2-hydroxyethyl, 2-  
2 (dimethylamino)ethyl, vinyl, ethyl, phenyl, 4-methoxyphenyl, 3-methoxyphenyl, 4-fluorophenyl,  
3 4-trifluoromethoxyphenyl, thiophenyl, carboxy, cyclopropyl, -CCH, -CH=CH-CCH, or CN.
- 1 68. The compound of claim 45 wherein R<sub>2</sub> is H and R<sub>4</sub> is methyl.
- 1 69. The compound of claim 60 wherein R<sub>2</sub> is H and R<sub>4</sub> is methyl.
- 1 70. The compound of claim 61 wherein R<sub>2</sub> is H and R<sub>4</sub> is methyl.



-203-

- 1 71. The compound of claim 62 wherein R<sub>2</sub> is H and R<sub>4</sub> is methyl.
- 1 72. The compound of claim 63 wherein R<sub>2</sub> is H and R<sub>4</sub> is methyl.
- 1 73. The compound of claim 64 wherein R<sub>2</sub> is H and R<sub>4</sub> is methyl.
- 1 74. The compound of claim 65 wherein R<sub>2</sub> is H and R<sub>4</sub> is methyl.
- 1 75. The compound of claim 66 wherein R<sub>2</sub> is H and R<sub>4</sub> is methyl.
- 1 76. The compound of claim 67 wherein R<sub>2</sub> is H and R<sub>4</sub> is methyl.
- 1 77. The compound of any of claims 69 through 76 wherein R<sub>10</sub>, R<sub>11</sub>, R<sub>12</sub>, R<sub>13</sub> and R<sub>14</sub> are each  
2 independently H, F, Cl, Br, CN, dimethylamino, ethoxycarbonyl, methylthio, methyl, ethyl,  
3 isopropyl, trifluoromethyl, trifluoromethoxy, methoxy, NH<sub>2</sub> or NO<sub>2</sub>.
- 1 78. The compound of claim 59 wherein R<sub>2</sub> is H and R<sub>4</sub> is methyl.
- 1 79. The compound of claim 78 wherein R<sub>3</sub> is Cl, Br, I, -COOCH<sub>3</sub>, 2-hydroxyethyl, 2-  
2 (dimethylamino)ethyl, vinyl, ethyl, phenyl, 4-methoxyphenyl, 3-methoxyphenyl, 4-fluorophenyl,  
3 4-trifluoromethoxyphenyl, thiophenyl, carboxy, cyclopropyl, -CCH, -CH=CH-CCH, or CN.
- 1 80. The compound of claim 50 wherein A is (C=O).
- 1 81. The compound of claim 80 wherein R<sub>4</sub> is methyl.
- 1 82. The compound of claim 81 wherein R<sub>2</sub> is H.
- 1 83. The compound of claim 82 wherein Q<sub>1</sub> is ethyl, 4-nitrophenyl, allyl, 4-methylphenyl, isopropyl,  
2 butyl, 2-isopropyl-5-methylcyclohexyl, benzyl, 3-bromophenyl, 4-fluorophenyl, 2-  
3 methoxyphenyl, 2-chlorophenyl, -C(CH<sub>3</sub>)=CH, 1-(N-pyridyl)ethyl, or 9-fluorenylmethyl.

84. The compound of claim 83 wherein R<sub>1</sub> is H, Cl, F, dimethylamino, pyrrolidin-1-yl, morpholin-1-yl, 4-methylpiperazin-1-yl, OH or OCH<sub>3</sub>; and R<sub>3</sub> is Cl, Br, I, -COOCH<sub>3</sub>, 2-hydroxyethyl, 2-(dimethylamino)ethyl, vinyl, ethyl, phenyl, 4-methoxyphenyl, 3-methoxyphenyl, 4-fluorophenyl, 4-trifluoromethoxyphenyl, thiophenyl, carboxy, cyclopropyl, -CCH, -CH=CH-CCH, or CN.

85. A compound of claim 45 selected from the group consisting of:

- 1-[3-(4-Chloro-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(4-chloro-phenyl)-urea;
- 1-[3-Chloro-5-(4-chloro-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(4-chloro-phenyl)-urea;
- 1-[3-(4-Chloro-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(2,4-dichloro-phenyl)-urea;
- 1-[3-(4-Chloro-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(1-phenyl-ethyl)-urea;
- 1-[3-(4-Chloro-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(4-cyano-phenyl)-urea;
- 1-[3-(4-Chloro-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(4-dimethylamino-phenyl)-urea;
- 4-{3-[3-(4-Chloro-2-methyl-2H-pyrazol-3-yl)-phenyl]-ureido}-benzoic acid ethyl ester;
- 1-[3-(4-Chloro-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(4-methylsulfanyl-phenyl)-urea;
- 1-[3-(4-Chloro-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(4-isopropyl-phenyl)-urea;
- 1-(4-Chloro-phenyl)-3-[3-(4-iodo-2-methyl-2H-pyrazol-3-yl)-phenyl]-urea;
- [3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-carbamic acid ethyl ester;
- [3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-carbamic acid 4-nitro-phenyl ester;
- [3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-carbamic acid 9*H*-fluoren-9-ylmethyl ester;
- [3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-carbamic acid allyl ester;
- [3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-carbamic acid p-tolyl ester;
- [3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-carbamic acid butyl ester;
- [3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-carbamic acid 2-isopropyl-5-methyl-cyclohexyl ester;
- [3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-carbamic acid benzyl ester;
- [3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-carbamic acid 3-trifluoromethyl-phenyl ester;
- [3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-carbamic acid 4-bromo-phenyl ester;
- [3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-carbamic acid 4-fluoro-phenyl ester;
- [3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-carbamic acid 2-methoxy-phenyl ester;
- [3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-carbamic acid 2-chloro-phenyl ester;
- [3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-carbamic acid isopropenyl ester;

- 29 [3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-carbamic acid 1-pyridin-1-yl-ethyl  
30 ester;  
31 [3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-carbamic acid isopropyl ester;  
32 5-{3-[3-(4-Chloro-phenyl)-ureido]-phenyl}-1-methyl-1H-pyrazole-4-carboxylic acid  
33 methyl ester;  
34 1-(4-Fluoro-phenyl)-3-{3-[4-(2-hydroxy-ethyl)-2-methyl-2H-pyrazol-3-yl]-phenyl}-urea;  
35 1-{3-[4-(2-Dimethylamino-ethyl)-2-methyl-2H-pyrazol-3-yl]-phenyl}-3-(4-fluoro-  
36 phenyl)-urea;  
37 1-(4-Chloro-phenyl)-3-[3-(2-methyl-4-vinyl-2H-pyrazol-3-yl)-phenyl]-urea;  
38 1-(4-Chloro-phenyl)-3-[3-(4-ethyl-2-methyl-2H-pyrazol-3-yl)-phenyl]-urea;  
39 1-(4-Fluoro-phenyl)-3-[3-(2-methyl-4-vinyl-2H-pyrazol-3-yl)-phenyl]-urea;  
40 1-(4-Chloro-phenyl)-3-[3-(2-methyl-4-phenyl-2H-pyrazol-3-yl)-phenyl]-urea;  
41 1-(4-Chloro-phenyl)-3-{3-[4-(4-methoxy-phenyl)-2-methyl-2H-pyrazol-3-yl]-phenyl}-  
42 urea;  
43 1-(4-Chloro-phenyl)-3-{3-[4-(3-methoxy-phenyl)-2-methyl-2H-pyrazol-3-yl]-phenyl}-  
44 urea;  
45 1-(4-Chloro-phenyl)-3-{3-[4-(4-fluoro-phenyl)-2-methyl-2H-pyrazol-3-yl]-phenyl}-urea;  
46 1-(4-Chloro-phenyl)-3-{3-[2-methyl-4-(4-trifluoromethoxy-phenyl)-2H-pyrazol-3-yl]-  
47 phenyl}-urea;  
48 1-(4-Chloro-phenyl)-3-[3-(2-methyl-4-thiophen-2-yl-2H-pyrazol-3-yl)-phenyl]-urea;  
49 5-{3-[3-(4-Chloro-phenyl)-ureido]-phenyl}-1-methyl-1H-pyrazole-4-carboxylic acid;  
50 1-[3-(4-Cyclopropyl-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(3-trifluoromethyl-phenyl)-  
51 urea;  
52 1-(3-Chloro-phenyl)-3-[3-(4-cyclopropyl-2-methyl-2H-pyrazol-3-yl)-phenyl]-urea;  
53 1-[3-(4-Cyclopropyl-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(2-methoxy-phenyl)-urea;  
54 1-(4-Chloro-phenyl)-3-[3-(4-ethynyl-2-methyl-2H-pyrazol-3-yl)-phenyl]-urea;  
55 1-[3-(4-But-1-en-3-ynyl-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(4-chloro-phenyl)-urea;  
56 1-[3-(4-But-1-en-3-ynyl-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-p-tolyl-urea;  
57 1-(4-Chloro-phenyl)-3-[3-(4-cyano-2-methyl-2H-pyrazol-3-yl)-phenyl]-urea;  
58 1-[3-(4-Cyano-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(4-isopropyl-phenyl)-urea;  
59 1-[3-(4-Cyclopropyl-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(4-fluoro-phenyl)-urea;  
60 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-fluoro-phenyl]-3-(4-chloro-phenyl)-urea;

-206-

- 61 N-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-fluoro-phenyl]-4-fluoro-  
62 benzenesulfonamide;  
63 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-fluoro-phenyl]-3-(4-bromo-phenyl)-urea;  
64 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-fluoro-phenyl]-3-(4-isopropyl-phenyl)-urea;  
65 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-fluoro-phenyl]-3-(4-fluoro-phenyl)-urea;  
66 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-fluoro-phenyl]-3-(4-methoxy-phenyl)-urea;  
67 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-fluoro-phenyl]-3-(4-cyano-phenyl)-urea;  
68 N-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-fluoro-phenyl]-4-chloro-  
69 benzenesulfonamide;  
70 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-fluoro-phenyl]-3-(2,4-dichloro-phenyl)-  
71 urea;  
72 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-dimethylamino-phenyl]-3-(4-bromo-  
73 phenyl)-urea;  
74 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-pyrrolidin-1-yl-phenyl]-3-(1-phenyl-ethyl)-  
75 urea;  
76 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-morpholin-4-yl-phenyl]-3-(2,4-dichloro-  
77 phenyl)-urea;  
78 N-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-pyrrolidin-1-yl-phenyl]-benzamide;  
79 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-pyrrolidin-1-yl-phenyl]-3-(4-bromo-  
80 phenyl)-urea;  
81 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-pyrrolidin-1-yl-phenyl]-3-(4-  
82 dimethylamino-phenyl)-urea;  
83 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-morpholin-4-yl-phenyl]-3-(4-isopropyl-  
84 phenyl)-urea;  
85 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-(4-methyl-piperazin-1-yl)-phenyl]-3-(4-  
86 bromo-phenyl)-urea;  
87 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-dimethylamino-phenyl]-3-(4-chloro-  
88 phenyl)-urea;  
89 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-(4-methyl-piperazin-1-yl)-phenyl]-3-(2-  
90 trifluoromethoxy-phenyl)-urea;  
91 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-pyrrolidin-1-yl-phenyl]-3-(4-methoxy-  
92 phenyl)-thiourea;

-207-

- 93 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-(4-methyl-piperazin-1-yl)-phenyl]-3-(4-  
94 isopropyl-phenyl)-urea;
- 95 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-(4-methyl-piperazin-1-yl)-phenyl]-3-(4-  
96 chloro-phenyl)-urea;
- 97 N-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-pyrrolidin-1-yl-phenyl]-4-fluoro-  
98 benzenesulfonamide;
- 99 N-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-dimethylamino-phenyl]-4-chloro-  
100 benzenesulfonamide;
- 101 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-morpholin-4-yl-phenyl]-3-(4-fluoro-  
102 phenyl)-urea;
- 103 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-morpholin-4-yl-phenyl]-3-(4-chloro-  
104 phenyl)-urea;
- 105 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-pyrrolidin-1-yl-phenyl]-3-(2,4-dichloro-  
106 phenyl)-urea;
- 107 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-dimethylamino-phenyl]-3-(4-  
108 dimethylamino-phenyl)-urea;
- 109 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-(4-methyl-piperazin-1-yl)-phenyl]-3-(4-  
110 fluoro-phenyl)-urea;
- 111 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-pyrrolidin-1-yl-phenyl]-3-(4-methoxy-  
112 phenyl)-urea;
- 113 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-morpholin-4-yl-phenyl]-3-(2-phenyl-  
114 cyclopropyl)-urea;
- 115 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-(4-methyl-piperazin-1-yl)-phenyl]-3-(4-  
116 cyano-phenyl)-urea;
- 117 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-morpholin-4-yl-phenyl]-3-(4-cyano-phenyl)-  
118 urea;
- 119 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-dimethylamino-phenyl]-3-(4-fluoro-phenyl)-  
120 urea;
- 121 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-dimethylamino-phenyl]-3-(4-isopropyl-  
122 phenyl)-urea;
- 123 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-pyrrolidin-1-yl-phenyl]-3-(4-fluoro-phenyl)-  
124 urea;

-208-

- 125 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-(4-methyl-piperazin-1-yl)-phenyl]-3-(2-  
126 phenyl-cyclopropyl)-urea;  
127 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-(4-methyl-piperazin-1-yl)-phenyl]-3-(2,4-  
128 dichloro-phenyl)-urea;  
129 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-morpholin-4-yl-phenyl]-3-(4-  
130 trifluoromethyl-phenyl)-urea;  
131 1-(3-Amino-4-fluoro-phenyl)-3-[3-(4-bromo-2-methyl-2H-pyrazol-3-yl)-5-pyrrolidin-1-  
132 yl-phenyl]-urea;  
133 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-dimethylamino-phenyl]-3-(4-methoxy-  
134 phenyl)-urea;  
135 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-pyrrolidin-1-yl-phenyl]-3-(4-fluoro-3-nitro-  
136 phenyl)-urea;  
137 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-dimethylamino-phenyl]-3-(4-cyano-phenyl)-  
138 urea;  
139 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-pyrrolidin-1-yl-phenyl]-3-(1-phenyl-ethyl)-  
140 urea;  
141 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-pyrrolidin-1-yl-phenyl]-3-(2-phenyl-  
142 cyclopropyl)-urea;  
143 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-pyrrolidin-1-yl-phenyl]-3-(4-chloro-phenyl)-  
144 urea;  
145 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-morpholin-4-yl-phenyl]-3-(4-bromo-  
146 phenyl)-urea;  
147 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-pyrrolidin-1-yl-phenyl]-3-(4-cyano-phenyl)-  
148 urea;  
149 N-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-dimethylamino-phenyl]-4-fluoro-  
150 benzenesulfonamide;  
151 N-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-pyrrolidin-1-yl-phenyl]-  
152 benzenesulfonamide;  
153 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-morpholin-4-yl-phenyl]-3-(4-methoxy-  
154 phenyl)-urea;  
155 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-(4-methyl-piperazin-1-yl)-phenyl]-3-(4-  
156 dimethylamino-phenyl)-urea;

-209-

157 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-pyrrolidin-1-yl-phenyl]-3-(4-isopropyl-  
 158 phenyl)-urea;  
 159 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-methoxy-phenyl]-3-(4-fluoro-phenyl)-urea;  
 160 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-hydroxy-phenyl]-3-(3,5-dichloro-phenyl)-  
 161 urea;  
 162 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-hydroxy-phenyl]-3-(4-fluoro-phenyl)-urea;  
 163 N-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-methoxy-phenyl]-4-chloro-  
 164 benzenesulfonamide;  
 165 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-methoxy-phenyl]-3-(4-dimethylamino-  
 166 phenyl)-urea;  
 167 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-methoxy-phenyl]-3-(4-bromo-phenyl)-urea;  
 168 N-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-hydroxy-phenyl]-4-chloro-  
 169 benzenesulfonamide;  
 170 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-methoxy-phenyl]-3-(3,5-dichloro-phenyl)-  
 171 urea;  
 172 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-hydroxy-phenyl]-3-(4-chloro-phenyl)-urea;  
 173 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-methoxy-phenyl]-3-(4-chloro-phenyl)-urea;  
 174 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-methoxy-phenyl]-3-(2,4-dichloro-phenyl)-  
 175 urea;  
 176 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-pyrrolidin-1-yl-phenyl]-3-(4-  
 177 trifluoromethyl-phenyl)-urea;  
 178 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-hydroxy-phenyl]-3-(4-methoxy-phenyl)-  
 179 urea;  
 180 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-methoxy-phenyl]-3-(4-methoxy-phenyl)-  
 181 urea;  
 182 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-5-hydroxy-phenyl]-3-(4-cyano-phenyl)-urea  
 183 and  
 184 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(4-chloro-phenyl)-thiourea.

- 1 86. A compound of claim 45 selected from the group consisting of:  
 2 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(3,4-difluoro-phenyl)-urea;  
 3 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(2,5-difluoro-phenyl)-urea;  
 4 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(3,5-difluoro-phenyl)-urea;

-210-

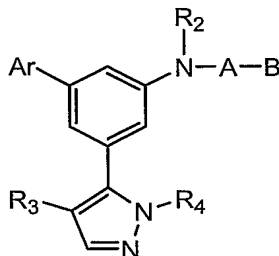
5 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(3-chloro-4-fluoro-phenyl)-urea;  
 6 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(4-fluoro-2-trifluoromethyl-  
 7 phenyl)-urea;  
 8 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(4-fluoro-3-trifluoromethyl-  
 9 phenyl)-urea;  
 10 1-[3-(4-Chloro-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(2,5-difluoro-phenyl)-urea;  
 11 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(2,3,4-trifluoro-phenyl)-urea;  
 12 1-[3-(4-Chloro-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(3,5-difluoro-phenyl)-urea;  
 13 1-(3-Chloro-4-fluoro-phenyl)-3-[3-(4-chloro-2-methyl-2H-pyrazol-3-yl)-phenyl]-urea;  
 14 1-[3-(4-Chloro-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(2,4-difluoro-phenyl)-urea;  
 15 1-[3-(4-Chloro-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(2,3,4-trifluoro-phenyl)-urea;  
 16 1-[3-(4-Chloro-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(4-fluoro-2-trifluoromethyl-  
 17 phenyl)-urea;  
 18 1-[3-(4-Chloro-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(4-chloro-2-trifluoromethyl-  
 19 phenyl)-urea;  
 20 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(4-chloro-3-trifluoromethyl-  
 21 phenyl)-urea  
 22 and  
 23 1-[3-(4-Chloro-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(4-fluoro-3-trifluoromethyl-phenyl)-urea.

1 87. A compound of claim 45 selected from the group consisting of:  
 2 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(2-chloro-4-trifluoromethyl-  
 3 phenyl)-urea;  
 4 1-(3,4-Bis-trifluoromethyl-phenyl)-3-[3-(4-bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-  
 5 urea;  
 6 3-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-1-(4-fluoro-phenyl)-1-methyl-urea;  
 7 1-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-3-(3-fluoro-4-trifluoromethyl-  
 8 phenyl)-urea;  
 9 3-[3-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-phenyl]-1-(4-chloro-phenyl)-1-methyl-urea;  
 10 3-[3-(4-Chloro-2-methyl-2H-pyrazol-3-yl)-phenyl]-1-(4-chloro-phenyl)-1-methyl-urea  
 11 and  
 12 3-[3-(4-Chloro-2-methyl-2H-pyrazol-3-yl)-phenyl]-1-(4-fluoro-phenyl)-1-methyl-urea.



-211-

1 88. A compound of Formula (XV):



(XV)

2  
3 wherein:

4 i) Ar is a phenyl ring optionally substituted with up to five groups selected from the group  
5 consisting of halogen, OR<sub>7</sub>, OH, NR<sub>8</sub>R<sub>9</sub>, carboxy, CN, alkoxycarbonyl, straight chain or  
6 branched C<sub>1-6</sub> alkyl -C(p)<sub>3</sub>, or -O-C(p)<sub>3</sub> where p is halogen;

7 R<sub>8</sub> and R<sub>9</sub> are independently a H, or C<sub>1-6</sub> alkyl, or C<sub>2-6</sub> alkenyl, or cycloalkyl, or  
8 aryl, or CH<sub>2</sub> aryl group and each said group may be optionally substituted by up to four  
9 substituents in any position independently selected from halogen, CF<sub>3</sub>, OCF<sub>3</sub>, OEt, CCl<sub>3</sub>,  
10 Me, NO<sub>2</sub>, OH, OMe, SMe, COMe, CN, COOR<sub>10</sub>, SO<sub>3</sub>R<sub>10</sub>, COEt, NHCOCH<sub>3</sub>, or aryl; or

11 R<sub>8</sub> and R<sub>9</sub> may form part of a 5, 6 or 7 membered cyclic structure which may be  
12 either saturated or unsaturated and that may contain up to four heteroatoms selected from  
13 O, N or S and said cyclic structure may be optionally substituted by up to four  
14 substituents in any position independently selected from CF<sub>3</sub>, CCl<sub>3</sub>, Me, NO<sub>2</sub>, OH, OMe,  
15 OEt, OCF<sub>3</sub>, SMe, COOR<sub>10</sub>, SO<sub>2</sub>NR<sub>8</sub>R<sub>9</sub>, SO<sub>3</sub>R<sub>10</sub>, NHCOCH<sub>3</sub>, COEt, COMe, or halogen;

16 R<sub>7</sub> is H or C<sub>1-6</sub> alkyl;

17 R<sub>10</sub> is H or C<sub>1-6</sub> alkyl;

18 ii) R<sub>2</sub> is H, straight chain or branched C<sub>1-6</sub> alkyl, C<sub>2-6</sub> alkenyl, or cycloalkyl;

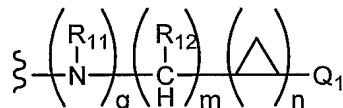
19 iii) R<sub>3</sub> is halogen, carboxy, CN, alkoxycarbonyl, straight chain or branched C<sub>1-6</sub> alkyl, C<sub>2-6</sub>  
20 alkenyl, C<sub>2-6</sub> alkynyl, cycloalkyl, aryl or heteroaryl, wherein each of said alkoxycarbonyl,  
21 straight chain or branched C<sub>1-6</sub> alkyl, C<sub>2-6</sub> alkenyl, C<sub>2-6</sub> alkynyl, cycloalkyl, aryl or  
22 heteroaryl groups can be optionally substituted with up to four substituents in any  
23 position selected from OH, OR<sub>10</sub>, NR<sub>8</sub>R<sub>9</sub>, halogen, -C(p)<sub>3</sub>, or -O-C(p)<sub>3</sub> where p is  
24 halogen, and said cycloalkyl, aryl or heteroaryl groups can alternatively or additionally be  
25 optionally substituted with up to four alkyl substituents in any position;

26 iv) R<sub>4</sub> is C<sub>1-6</sub> alkyl, C<sub>2-6</sub> alkenyl, or cycloalkyl;

27 v) A is C(=O), C(=S) or SO<sub>2</sub>;

28 vi) B is L<sub>1</sub> or L<sub>2</sub>;

-212-

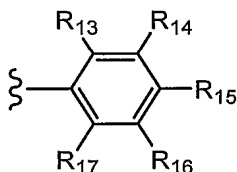
L<sub>1</sub> is:

q is 0 or 1;

m is 0 or 1;

n is 0 or 1;

R<sub>11</sub> and R<sub>12</sub> are each independently H, straight chain or branched C<sub>1-6</sub> alkyl, C<sub>2-6</sub> alkenyl, or cycloalkyl;

Q<sub>1</sub> is:

wherein:

R<sub>13</sub>, R<sub>14</sub>, R<sub>15</sub>, R<sub>16</sub> and R<sub>17</sub> are each independently H, halogen, CN, NR<sub>8</sub>R<sub>9</sub>, COOR<sub>10</sub>, SR<sub>10</sub>, straight chain or branched C<sub>1-6</sub> alkyl, C<sub>2-6</sub> alkenyl, C<sub>2-6</sub> alkynyl, cycloalkyl, aryl, alkylaryl, arylalkyl or heteroaryl, wherein each of said alkoxycarbonyl, straight chain or branched C<sub>1-6</sub> alkyl, C<sub>2-6</sub> alkenyl, C<sub>2-6</sub> alkynyl, cycloalkyl, aryl, alkylaryl, arylalkyl or heteroaryl groups can be optionally substituted with up to four substituents in any position selected from NO<sub>2</sub>, OR<sub>10</sub>, NR<sub>8</sub>R<sub>9</sub>, halogen, -C(p)<sub>3</sub>, or -O-C(p)<sub>3</sub> where p is halogen, and said cycloalkyl, aryl, alkylaryl, arylalkyl or heteroaryl groups can alternatively or additionally be optionally substituted with up to four alkyl substituents in any position;

L<sub>2</sub> is -O-Q<sub>2</sub> wherein Q<sub>2</sub> is straight chain or branched C<sub>1-6</sub> alkyl,

C<sub>2-6</sub> alkenyl, C<sub>2-6</sub> alkynyl, cycloalkyl, aryl, alkylaryl, arylalkyl, wherein each of said cycloalkyl, aryl, alkylaryl, or arylalkyl groups can be optionally substituted with up to four substituents in any position selected from NO<sub>2</sub>, OR<sub>7</sub>, halogen, -C(p)<sub>3</sub>, or -O-C(p)<sub>3</sub> where p is halogen, or an aliphatic or aromatic heterocycle, and said cycloalkyl, aryl, alkylaryl, and arylalkyl groups can alternatively or additionally be optionally substituted with up to four alkyl substituents in any position; or

a pharmaceutically acceptable salt.

-213-

- 1 89. The compound of claim 88 wherein B is L<sub>1</sub>, q is 1, m is 0, and n is 0.
- 1 90. The compound of claim 88 wherein B is L<sub>1</sub>, q is 1, m is 1, and n is 0.
- 1 91. The compound of claim 88 wherein B is L<sub>1</sub>, q is 1, m is 0, and n is 1.
- 1 92. The compound of claim 88 wherein B is L<sub>1</sub>, q is 0, m is 0, and n is 0.
- 1 93. The compound of claim 88 wherein B is L<sub>2</sub>.
- 1 94. The compound of claim 89 wherein A is C(=O).
- 1 95. The compound of claim 90 wherein A is C(=O).
- 1 96. The compound of claim 91 wherein A is C(=O).
- 1 97. The compound of claim 92 wherein A is C(=O).
- 1 98. The compound of claim 89 wherein A is C(=S).
- 1 99. The compound of claim 90 wherein A is C(=S).
- 1 100. The compound of claim 91 wherein A is C(=S).
- 1 101. The compound of claim 92 wherein A is C(=S).
- 1 102. The compound of claim 92 wherein A is SO<sub>2</sub>.
- 1 103. The compound of claim 88 wherein Ar is 4-methoxyphenyl or 4-fluorophenyl.

-214-

- 1 104. The compound of claim 88 wherein R<sub>3</sub> is Cl, Br, I, -COOCH<sub>3</sub>, 2-hydroxyethyl, 2-  
2 (dimethylamino)ethyl, vinyl, ethyl, phenyl, 4-methoxyphenyl, 3-methoxyphenyl, 4-fluorophenyl,  
3 4-trifluoromethoxyphenyl, thiophenyl, carboxy, cyclopropyl, -CCH, -CH=CH-CCH, or CN.
- 1 105. The compound of claim 94 wherein Ar is 4-methoxyphenyl or 4-fluorophenyl.
- 1 106. The compound of claim 94 wherein R<sub>3</sub> is Cl, Br, I, -COOCH<sub>3</sub>, 2-hydroxyethyl, 2-  
2 (dimethylamino)ethyl, vinyl, ethyl, phenyl, 4-methoxyphenyl, 3-methoxyphenyl, 4-fluorophenyl,  
3 4-trifluoromethoxyphenyl, thiophenyl, carboxy, cyclopropyl, -CCH, -CH=CH-CCH, or CN.
- 1 107. The compound of claim 95 wherein Ar is 4-methoxyphenyl or 4-fluorophenyl.
- 1 108. The compound of claim 95 wherein R<sub>3</sub> is Cl, Br, I, -COOCH<sub>3</sub>, 2-hydroxyethyl, 2-  
2 (dimethylamino)ethyl, vinyl, ethyl, phenyl, 4-methoxyphenyl, 3-methoxyphenyl, 4-fluorophenyl,  
3 4-trifluoromethoxyphenyl, thiophenyl, carboxy, cyclopropyl, -CCH, -CH=CH-CCH, or CN.
- 1 109. The compound of claim 96 wherein Ar is 4-methoxyphenyl or 4-fluorophenyl.
- 1 110. The compound of claim 96 wherein R<sub>3</sub> is Cl, Br, I, -COOCH<sub>3</sub>, 2-hydroxyethyl, 2-  
2 (dimethylamino)ethyl, vinyl, ethyl, phenyl, 4-methoxyphenyl, 3-methoxyphenyl, 4-fluorophenyl,  
3 4-trifluoromethoxyphenyl, thiophenyl, carboxy, cyclopropyl, -CCH, -CH=CH-CCH, or CN.
- 1 111. The compound of claim 88 wherein R<sub>2</sub> is H and R<sub>4</sub> is methyl.
- 1 112. The compound of claim 103 wherein R<sub>2</sub> is H and R<sub>4</sub> is methyl.
- 1 113. The compound of claim 104 wherein R<sub>2</sub> is H and R<sub>4</sub> is methyl.
- 1 114. The compound of claim 105 wherein R<sub>2</sub> is H and R<sub>4</sub> is methyl.
- 1 115. The compound of claim 106 wherein R<sub>2</sub> is H and R<sub>4</sub> is methyl.
- 1 116. The compound of claim 107 wherein R<sub>2</sub> is H and R<sub>4</sub> is methyl.

-215-

- 1 117. The compound of claim 108 wherein R<sub>2</sub> is H and R<sub>4</sub> is methyl.
- 1 118. The compound of claim 109 wherein R<sub>2</sub> is H and R<sub>4</sub> is methyl.
- 1 119. The compound of claim 110 wherein R<sub>2</sub> is H and R<sub>4</sub> is methyl.
- 1 120. The compound of any of claims 112 through 119 wherein R<sub>13</sub>, R<sub>14</sub>, R<sub>15</sub>, R<sub>16</sub> and R<sub>17</sub> are each  
2 independently H, F, Cl, Br, CN, dimethylamino, ethoxycarbonyl, methylthio, methyl, ethyl,  
3 isopropyl, trifluoromethyl, trifluoromethoxy, methoxy, NH<sub>2</sub> or NO<sub>2</sub>.
- 1 121. The compound of claim 102 wherein R<sub>2</sub> is H and R<sub>4</sub> is methyl.
- 1 122. The compound of claim 121 wherein R<sub>3</sub> is Cl, Br, I, -COOCH<sub>3</sub>, 2-hydroxyethyl, 2-  
2 (dimethylamino)ethyl, vinyl, ethyl, phenyl, 4-methoxyphenyl, 3-methoxyphenyl, 4-fluorophenyl,  
3 4-trifluoromethoxyphenyl, thiophenyl, carboxy, cyclopropyl, -CCH, -CH=CH-CCH, or CN.
- 1 123. The compound of claim 93 wherein A is (C=O).
- 1 124. The compound of claim 123 wherein R<sub>4</sub> is methyl.
- 1 125. The compound of claim 124 wherein R<sub>2</sub> is H.
- 1 126. The compound of claim 125 wherein Q<sub>1</sub> is ethyl, 4-nitrophenyl, allyl, 4-methylphenyl, isopropyl,  
2 butyl, 2-isopropyl-5-methylcyclohexyl, benzyl, 3-bromophenyl, 4-fluorophenyl, 2-  
3 methoxyphenyl, 2-chlorophenyl, -C(CH<sub>3</sub>)=CH, 1-(N-pyridyl)ethyl, or 9-fluorenylmethyl.
- 1 127. The compound of claim 126 wherein Ar is 4-methoxyphenyl or 4-fluorophenyl; and R<sub>3</sub> is Cl, Br,  
2 I, -COOCH<sub>3</sub>, 2-hydroxyethyl, 2-(dimethylamino)ethyl, vinyl, ethyl, phenyl, 4-methoxyphenyl, 3-  
3 methoxyphenyl, 4-fluorophenyl, 4-trifluoromethoxyphenyl, thiophenyl, carboxy, cyclopropyl, -  
4 CCH, -CH=CH-CCH, or CN.
- 1 128. The compound of claim 88 selected from the group consisting of:

-216-

1-[5-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-4'-methoxy-biphenyl-3-yl]-3-(4-chloro-phenyl)-urea;

1-[5-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-4'-methoxy-biphenyl-3-yl]-3-(4-fluoro-phenyl)-urea;

1-[5-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-4'-methoxy-biphenyl-3-yl]-3-(4-trifluoromethyl-phenyl)-urea;

1-[5-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-4'-methoxy-biphenyl-3-yl]-3-(2,4-dichloro-phenyl)-urea;

1-[5-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-4'-methoxy-biphenyl-3-yl]-3-(4-bromo-phenyl)-urea;

1-[5-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-4'-methoxy-biphenyl-3-yl]-3-(4-methoxy-phenyl)-urea;

1-[5-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-4'-methoxy-biphenyl-3-yl]-3-(4-cyano-phenyl)-urea;

1-[5-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-4'-methoxy-biphenyl-3-yl]-3-(4-isopropyl-phenyl)-urea;

1-[5-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-4'-methoxy-biphenyl-3-yl]-3-(4-dimethylamino-phenyl)-urea;

1-[5-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-4'-methoxy-biphenyl-3-yl]-3-(2-phenyl-cyclopropyl)-urea;

1-[5-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-4'-fluoro-biphenyl-3-yl]-3-(4-chloro-phenyl)-urea;

1-[5-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-4'-fluoro-biphenyl-3-yl]-3-(4-fluoro-phenyl)-urea;

1-[5-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-4'-fluoro-biphenyl-3-yl]-3-(4-trifluoromethyl-phenyl)-urea;

1-[5-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-4'-fluoro-biphenyl-3-yl]-3-(2,4-dichloro-phenyl)-urea;

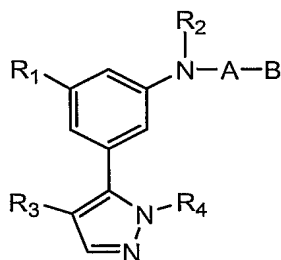
1-[5-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-4'-fluoro-biphenyl-3-yl]-3-(4-bromo-phenyl)-urea.

1-[5-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-4'-fluoro-biphenyl-3-yl]-3-(4-methoxy-phenyl)-urea;

-217-

1-[5-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-4'-fluoro-biphenyl-3-yl]-3-(4-cyano-phenyl)-urea;  
 1-[5-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-4'-fluoro-biphenyl-3-yl]-3-(4-isopropyl-phenyl)-urea;  
 1-[5-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-4'-fluoro-biphenyl-3-yl]-3-(4-dimethylamino-phenyl)-urea  
 and  
 1-[5-(4-Bromo-2-methyl-2H-pyrazol-3-yl)-4'-fluoro-biphenyl-3-yl]-3-(2-phenyl-cyclopropyl)-urea.

129. A method for modulating the activity of a human 5-HT<sub>2A</sub> serotonin receptor by contacting the receptor with a compound of Formula (I):



(I)

wherein:

- i) R<sub>1</sub> is H, halogens, NR<sub>5</sub>R<sub>6</sub>, OH or OR<sub>7</sub>, wherein

R<sub>5</sub> and R<sub>6</sub> are independently H, or C<sub>1-6</sub> alkyl, or C<sub>2-6</sub> alkenyl, or cycloalkyl, or aryl, or CH<sub>2</sub> aryl group and each said group may be optionally substituted by up to four substituents in any position independently selected from CF<sub>3</sub>, CCl<sub>3</sub>, Me, NO<sub>2</sub>, OH, OMe, OEt, CONR<sub>8</sub>R<sub>9</sub>, NR<sub>8</sub>R<sub>9</sub>, NHCOCH<sub>3</sub>, OCF<sub>3</sub>, SMe, COOR<sub>10</sub>, SO<sub>3</sub>R<sub>8</sub>, SO<sub>2</sub>NR<sub>8</sub>R<sub>9</sub>, COMe, COEt, CO-lower alkyl, SCF<sub>3</sub>, CN, C<sub>2-6</sub> alkenyl, H, halogens, C<sub>1-4</sub> alkoxy, C<sub>3-6</sub> cycloalkyl, C<sub>1-6</sub> alkyl, and aryl wherein each of the C<sub>3-6</sub> cycloalkyl, C<sub>1-6</sub> alkyl, or aryl groups may be further optionally substituted by up to four substituents in any position independently selected from CF<sub>3</sub>, CCl<sub>3</sub>, Me, NO<sub>2</sub>, OH, OMe, OEt, CONR<sub>8</sub>R<sub>9</sub>, NR<sub>8</sub>R<sub>9</sub>, NHCOCH<sub>3</sub>, OCF<sub>3</sub>, SMe, COOR<sub>10</sub>, SO<sub>2</sub>NR<sub>8</sub>R<sub>9</sub>, SO<sub>3</sub>R<sub>10</sub>, COMe, COEt, CO-lower alkyl, SCF<sub>3</sub>, CN, C<sub>2-6</sub> alkenyl, H, halogens, C<sub>1-4</sub> alkoxy, C<sub>3-6</sub> cycloalkyl, C<sub>1-6</sub> alkyl, and aryl; or

R<sub>5</sub> and R<sub>6</sub> may form part of a 5, 6 or 7 membered cyclic structure which may be either saturated or unsaturated and that may contain up to four heteroatoms selected from O, N or S and said cyclic structure may be optionally substituted by up to four

-218-

substituents in any position independently selected from CF<sub>3</sub>, CCl<sub>3</sub>, Me, NO<sub>2</sub>, OH, OMe, OEt, OCF<sub>3</sub>, SMe, COOR<sub>10</sub>, SO<sub>2</sub>NR<sub>8</sub>R<sub>9</sub>, SO<sub>3</sub>R<sub>10</sub>, NHCOCH<sub>3</sub>, COEt, COMe, or halogen;

R<sub>8</sub> and R<sub>9</sub> are independently a H, or C<sub>1-6</sub> alkyl, or C<sub>2-6</sub> alkenyl, or cycloalkyl, or aryl, or CH<sub>2</sub> aryl group and each said group may be optionally substituted by up to four substituents in any position independently selected from halogen, CF<sub>3</sub>, OCF<sub>3</sub>, OEt, CCl<sub>3</sub>, Me, NO<sub>2</sub>, OH, OMe, SMe, COMe, CN, COOR<sub>10</sub>, SO<sub>3</sub>R<sub>10</sub>, COEt, NHCOCH<sub>3</sub>, or aryl;

R<sub>10</sub> is H or C<sub>1-6</sub> alkyl;

R<sub>7</sub> is H or C<sub>1-6</sub> alkyl;

ii) R<sub>2</sub> is H, straight chain or branched C<sub>1-6</sub> alkyl, C<sub>2-6</sub> alkenyl, or cycloalkyl;

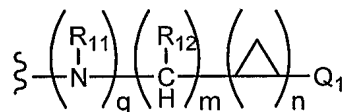
iii) R<sub>3</sub> is halogen, carboxy, CN, alkoxycarbonyl, straight chain or branched C<sub>1-6</sub> alkyl, C<sub>2-6</sub> alkenyl, C<sub>2-6</sub> alkynyl, cycloalkyl, aryl or heteroaryl, wherein each of said alkoxycarbonyl, straight chain or branched C<sub>1-6</sub> alkyl, C<sub>2-6</sub> alkenyl, C<sub>2-6</sub> alkynyl, cycloalkyl, aryl or heteroaryl groups can be optionally substituted with up to four substituents in any position selected from OH, OR<sub>10</sub>, NR<sub>8</sub>R<sub>9</sub>, halogen, -C(p)<sub>3</sub>, or -O-C(p)<sub>3</sub> where p is halogen, and said cycloalkyl, aryl or heteroaryl groups can alternatively or additionally be optionally substituted with up to four alkyl substituents in any position;

iv) R<sub>4</sub> is C<sub>1-6</sub> alkyl, C<sub>2-6</sub> alkenyl, or cycloalkyl;

v) A is C(=O), C(=S) or SO<sub>2</sub>;

vi) B is L<sub>1</sub> or L<sub>2</sub>;

L<sub>1</sub> is:



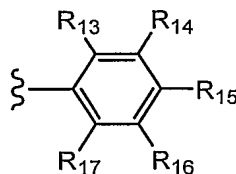
q is 0 or 1;

m is 0 or 1;

n is 0 or 1;

R<sub>11</sub> and R<sub>12</sub> are each independently H, straight chain or branched C<sub>1-6</sub> alkyl, C<sub>2-6</sub> alkenyl, or cycloalkyl;

Q<sub>1</sub> is:



wherein:

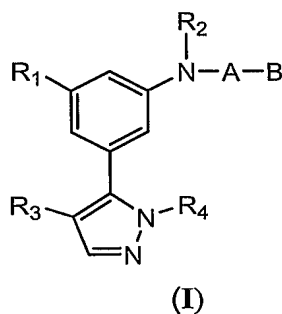


-219-

R<sub>13</sub>, R<sub>14</sub>, R<sub>15</sub>, R<sub>16</sub> and R<sub>17</sub> are each independently H, halogen, CN, NR<sub>8</sub>R<sub>9</sub>, COOR<sub>10</sub>, SR<sub>10</sub>, straight chain or branched C<sub>1-6</sub> alkyl, C<sub>2-6</sub> alkenyl, C<sub>2-6</sub> alkynyl, cycloalkyl, aryl, alkylaryl, arylalkyl or heteroaryl, wherein each of said alkoxy carbonyl, straight chain or branched C<sub>1-6</sub> alkyl, C<sub>2-6</sub> alkenyl, C<sub>2-6</sub> alkynyl, cycloalkyl, aryl, alkylaryl, arylalkyl or heteroaryl groups can be optionally substituted with up to four substituents in any position selected from NO<sub>2</sub>, OR<sub>10</sub>, NR<sub>8</sub>R<sub>9</sub>, halogen, -C(p)<sub>3</sub>, or -O-C(p)<sub>3</sub> where p is halogen, and said cycloalkyl, aryl, alkylaryl, arylalkyl or heteroaryl groups can alternatively or additionally be optionally substituted with up to four alkyl substituents in any position;

L<sub>2</sub> is -O-Q<sub>2</sub> wherein Q<sub>2</sub> is straight chain or branched C<sub>1-6</sub> alkyl, C<sub>2-6</sub> alkenyl, C<sub>2-6</sub> alkynyl, cycloalkyl, aryl, alkylaryl, arylalkyl, wherein each of said cycloalkyl, aryl, alkylaryl, or arylalkyl groups can be optionally substituted with up to four substituents in any position selected from NO<sub>2</sub>, OR<sub>7</sub>, halogen, -C(p)<sub>3</sub>, or -O-C(p)<sub>3</sub> where p is halogen, or an aliphatic or aromatic heterocycle, and said cycloalkyl, aryl, alkylaryl, and arylalkyl groups can alternatively or additionally be optionally substituted with up to four alkyl substituents in any position; or a pharmaceutically acceptable salt.

130. A method for modulating the activity of a human 5-HT<sub>2A</sub> serotonin receptor by contacting the receptor with a compound of Formula (I):



wherein:

- i) R<sub>1</sub> is H, halogens, NR<sub>5</sub>R<sub>6</sub>, OH or OR<sub>7</sub>, wherein

R<sub>5</sub> and R<sub>6</sub> are independently H, or C<sub>1-6</sub> alkyl, or C<sub>2-6</sub> alkenyl, or cycloalkyl, or aryl, or CH<sub>2</sub> aryl group and each said group may be optionally substituted by up to four substituents in any position independently selected from CF<sub>3</sub>, CCl<sub>3</sub>, Me, NO<sub>2</sub>, OH, OMe, OEt, CONR<sub>8</sub>R<sub>9</sub>, NR<sub>8</sub>R<sub>9</sub>, NHCOCH<sub>3</sub>, OCF<sub>3</sub>, SMe, COOR<sub>10</sub>, SO<sub>3</sub>R<sub>8</sub>, SO<sub>2</sub>NR<sub>8</sub>R<sub>9</sub>, COMe,

-220-

COEt, CO-lower alkyl, SCF<sub>3</sub>, CN, C<sub>2-6</sub> alkenyl, H, halogens, C<sub>1-4</sub> alkoxy, C<sub>3-6</sub> cycloalkyl, C<sub>1-6</sub> alkyl, and aryl wherein each of the C<sub>3-6</sub> cycloalkyl, C<sub>1-6</sub> alkyl, or aryl groups may be further optionally substituted by up to four substituents in any position independently selected from CF<sub>3</sub>, CCl<sub>3</sub>, Me, NO<sub>2</sub>, OH, OMe, OEt, CONR<sub>8</sub>R<sub>9</sub>, NR<sub>8</sub>R<sub>9</sub>, NHCOCH<sub>3</sub>, OCF<sub>3</sub>, SMe, COOR<sub>10</sub>, SO<sub>2</sub>NR<sub>8</sub>R<sub>9</sub>, SO<sub>3</sub>R<sub>10</sub>, COMe, COEt, CO-lower alkyl, SCF<sub>3</sub>, CN, C<sub>2-6</sub> alkenyl, H, halogens, C<sub>1-4</sub> alkoxy, C<sub>3-6</sub> cycloalkyl, C<sub>1-6</sub> alkyl, and aryl; or

R<sub>5</sub> and R<sub>6</sub> may form part of a 5, 6 or 7 membered cyclic structure which may be either saturated or unsaturated and that may contain up to four heteroatoms selected from O, N or S and said cyclic structure may be optionally substituted by up to four substituents in any position independently selected from CF<sub>3</sub>, CCl<sub>3</sub>, Me, NO<sub>2</sub>, OH, OMe, OEt, OCF<sub>3</sub>, SMe, COOR<sub>10</sub>, SO<sub>2</sub>NR<sub>8</sub>R<sub>9</sub>, SO<sub>3</sub>R<sub>10</sub>, NHCOCH<sub>3</sub>, COEt, COMe, or halogen;

R<sub>8</sub> and R<sub>9</sub> are independently a H, or C<sub>1-6</sub> alkyl, or C<sub>2-6</sub> alkenyl, or cycloalkyl, or aryl, or CH<sub>2</sub> aryl group and each said group may be optionally substituted by up to four substituents in any position independently selected from halogen, CF<sub>3</sub>, OCF<sub>3</sub>, OEt, CCl<sub>3</sub>, Me, NO<sub>2</sub>, OH, OMe, SMe, COMe, CN, COOR<sub>10</sub>, SO<sub>3</sub>R<sub>10</sub>, COEt, NHCOCH<sub>3</sub>, or aryl;

R<sub>10</sub> is H or C<sub>1-6</sub> alkyl;

R<sub>7</sub> is H or C<sub>1-6</sub> alkyl;

ii) R<sub>2</sub> is H, straight chain or branched C<sub>1-6</sub> alkyl, C<sub>2-6</sub> alkenyl, or cycloalkyl;

iii) R<sub>3</sub> is halogen, carboxy, CN, alkoxycarbonyl, straight chain or branched C<sub>1-6</sub> alkyl, C<sub>2-6</sub> alkenyl, C<sub>2-6</sub> alkynyl, cycloalkyl, aryl or heteroaryl, wherein each of said alkoxycarbonyl, straight chain or branched C<sub>1-6</sub> alkyl, C<sub>2-6</sub> alkenyl, C<sub>2-6</sub> alkynyl, cycloalkyl, aryl or heteroaryl groups can be optionally substituted with up to four substituents in any position selected from OH, OR<sub>10</sub>, NR<sub>8</sub>R<sub>9</sub>, halogen,

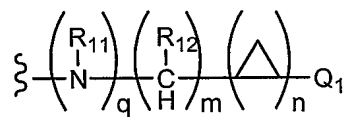
-C(p)<sub>3</sub>, or -O-C(p)<sub>3</sub> where p is halogen, and said cycloalkyl, aryl or heteroaryl groups can alternatively or additionally be optionally substituted with up to four alkyl substituents in any position;

iv) R<sub>4</sub> is C<sub>1-6</sub> alkyl, C<sub>2-6</sub> alkenyl, or cycloalkyl;

v) A is C(=O), C(=S) or SO<sub>2</sub>;

vi) B is L<sub>1</sub> or L<sub>2</sub>;

L<sub>1</sub> is:



q is 0 or 1;

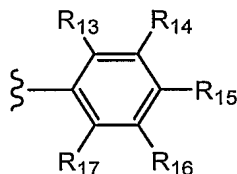
-221-

m is 0 or 1;

n is 0 or 1;

R<sub>11</sub> and R<sub>12</sub> are each independently H, straight chain or branched C<sub>1-6</sub> alkyl, C<sub>2-6</sub> alkenyl, or cycloalkyl;

Q<sub>1</sub> is:



wherein:

R<sub>13</sub>, R<sub>14</sub>, R<sub>15</sub>, R<sub>16</sub> and R<sub>17</sub> are each independently H, halogen, CN, NR<sub>8</sub>R<sub>9</sub>, COOR<sub>10</sub>, SR<sub>10</sub>, straight chain or branched C<sub>1-6</sub> alkyl, C<sub>2-6</sub> alkenyl, C<sub>2-6</sub> alkynyl, cycloalkyl, aryl, alkylaryl, arylalkyl or heteroaryl, wherein each of said alkoxy carbonyl, straight chain or branched C<sub>1-6</sub> alkyl, C<sub>2-6</sub> alkenyl, C<sub>2-6</sub> alkynyl, cycloalkyl, aryl, alkylaryl, arylalkyl or heteroaryl groups can be optionally substituted with up to four substituents in any position selected from NO<sub>2</sub>, OR<sub>10</sub>, NR<sub>8</sub>R<sub>9</sub>, halogen, -C(p)<sub>3</sub>, or -O-C(p)<sub>3</sub> where p is halogen, and said cycloalkyl, aryl, alkylaryl, arylalkyl or heteroaryl groups can alternatively or additionally be optionally substituted with up to four alkyl substituents in any position;

L<sub>2</sub> is -O-Q<sub>2</sub> wherein Q<sub>2</sub> is straight chain or branched C<sub>1-6</sub> alkyl, C<sub>2-6</sub> alkenyl, C<sub>2-6</sub> alkynyl, cycloalkyl, aryl, alkylaryl, arylalkyl, wherein each of said cycloalkyl, aryl, alkylaryl, or arylalkyl groups can be optionally substituted with up to four substituents in any position selected from NO<sub>2</sub>, OR<sub>7</sub>, halogen, -C(p)<sub>3</sub>, or -O-C(p)<sub>3</sub> where p is halogen, or an aliphatic or aromatic heterocycle, and said cycloalkyl, aryl, alkylaryl, and arylalkyl groups can alternatively or additionally be optionally substituted with up to four alkyl substituents in any position; or

a pharmaceutically acceptable salt; provided that the compound is not any of the following 43 compounds:

N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)(4-methoxyphenoxy)carboxamide;

N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)(2-thienyl)carboxamide;

N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)((4-trifluoromethoxyphenyl)amino)carboxamide;

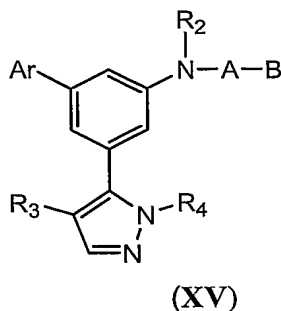
-222-

71 N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)((4-trifluoromethoxy)  
72 phenyl)methyl)amino)carboxamide;  
73 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(1,1-dimethylethoxy)carboxamide;  
74 N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)(4-trifluoromethoxyphenyl) carboxamide;  
75 N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)(4-chlorophenyl) carboxamide;  
76 N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)-2-(4-(trifluoromethoxy) phenyl)acetamide;  
77 N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)-2-(3-fluorophenyl) acetamide;  
78 N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)-2-(3-methoxyphenyl) acetamide;  
79 N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)-2-(2-fluorophenyl) acetamide;  
80 N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)-2-(4-nitrophenyl)acetamide;  
81 N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)-2-(2-methoxyphenyl) acetamide;  
82 N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)((4-methylthiophenyl)amino) carboxamide;  
83 N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)((4-chlorophenyl)amino) carboxamide;  
84 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(4-fluorophenyl) carboxamide;  
85 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(2-  
86 (trifluoromethoxy)phenyl)carboxamide;  
87 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(2-nitrophenyl) carboxamide;  
88 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(4-methoxyphenyl) carboxamide;  
89 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(2-methylphenyl) carboxamide;  
90 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(4-(trifluoromethyl)  
91 phenyl)carboxamide;  
92 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(3-chlorophenyl) carboxamide;  
93 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(2-chlorophenyl) carboxamide;  
94 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(4-(methylethyl)  
95 phenyl)carboxamide;  
96 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(3-methoxyphenyl) carboxamide;  
97 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(3-methylphenyl) carboxamide;  
98 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-methyl-N-(4-  
99 (trifluoromethoxy)phenyl)-carboxamide;  
100 N-(4-(tert-butyl)phenyl)((3-(4-bromo-2-methylpyrazol-3-yl)phenyl) amino)carboxamide;  
101 N-(4-(dimethylamino)phenyl)((3-(4-bromo-2-methylpyrazol-3-  
102 yl)phenyl)amino)carboxamide;

-223-

103 N-(3,5-dichloro-4-methylphenyl)((3-(4-bromo-2-methylpyrazol-3-  
 104 yl)phenyl)amino)carboxamide;  
 105 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(4-  
 106 (trifluoromethylthio)phenyl)carboxamide;  
 107 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(cyclohexyl) carboxamide;  
 108 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(phenylmethyl) carboxamide;  
 109 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(2-fluorophenyl) carboxamide;  
 110 2-(((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)-amino)carbonylamino) benzamide;  
 111 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(4-cyanophenyl) carboxamide;  
 112 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(2-cyanophenyl) carboxamide;  
 113 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(4-  
 114 fluorophenylmethyl)carboxamide;  
 115 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(3,4-  
 116 dimethoxyphenylmethyl)carboxamide;  
 117 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(3,4,5-  
 118 trimethoxyphenylmethyl)carboxamide;  
 119 N-(3-(4-bromo-2-methylpyrazol-3-yl)phenyl)-(((2-methylphenyl)methyl)  
 120 amino)carboxamide;  
 121 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(4-  
 122 methoxyphenylmethyl)carboxamide  
 123 and  
 124 ((3-(4-bromo-2-methylpyrazol-3-yl)phenyl)amino)-N-(2-(4-  
 125 methoxy)phenylethyl)carboxamide.

- 1 131. A method for modulating the activity of a human 5-HT<sub>2A</sub> serotonin receptor by contacting the  
 2 receptor with a compound of Formula (XV):



3  
 4 wherein:

-224-

i) Ar is a phenyl ring optionally substituted with up to five groups selected from the group consisting of halogen, OR<sub>7</sub>, OH, NR<sub>8</sub>R<sub>9</sub>, carboxy, CN, alkoxycarbonyl, straight chain or branched C<sub>1-6</sub> alkyl -C(p)<sub>3</sub>, or -O-C(p)<sub>3</sub> where p is halogen;

R<sub>8</sub> and R<sub>9</sub> are independently a H, or C<sub>1-6</sub> alkyl, or C<sub>2-6</sub> alkenyl, or cycloalkyl, or aryl, or CH<sub>2</sub> aryl group and each said group may be optionally substituted by up to four substituents in any position independently selected from halogen, CF<sub>3</sub>, OCF<sub>3</sub>, OEt, CCl<sub>3</sub>, Me, NO<sub>2</sub>, OH, OMe, SMe, COMe, CN, COOR<sub>10</sub>, SO<sub>3</sub>R<sub>10</sub>, COEt, NHCOCH<sub>3</sub>, or aryl; or

R<sub>8</sub> and R<sub>9</sub> may form part of a 5, 6 or 7 membered cyclic structure which may be either saturated or unsaturated and that may contain up to four heteroatoms selected from O, N or S and said cyclic structure may be optionally substituted by up to four substituents in any position independently selected from CF<sub>3</sub>, CCl<sub>3</sub>, Me, NO<sub>2</sub>, OH, OMe, OEt, OCF<sub>3</sub>, SMe, COOR<sub>10</sub>, SO<sub>2</sub>NR<sub>8</sub>R<sub>9</sub>, SO<sub>3</sub>R<sub>10</sub>, NHCOCH<sub>3</sub>, COEt, COMe, or halogen;

R<sub>7</sub> is H or C<sub>1-6</sub> alkyl;

R<sub>10</sub> is H or C<sub>1-6</sub> alkyl;

ii) R<sub>2</sub> is H, straight chain or branched C<sub>1-6</sub> alkyl, C<sub>2-6</sub> alkenyl, or cycloalkyl;

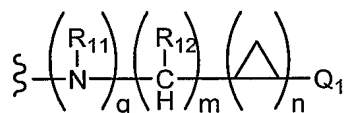
iii) R<sub>3</sub> is halogen, carboxy, CN, alkoxycarbonyl, straight chain or branched C<sub>1-6</sub> alkyl, C<sub>2-6</sub> alkenyl, C<sub>2-6</sub> alkynyl, cycloalkyl, aryl or heteroaryl, wherein each of said alkoxycarbonyl, straight chain or branched C<sub>1-6</sub> alkyl, C<sub>2-6</sub> alkenyl, C<sub>2-6</sub> alkynyl, cycloalkyl, aryl or heteroaryl groups can be optionally substituted with up to four substituents in any position selected from OH, OR<sub>10</sub>, NR<sub>8</sub>R<sub>9</sub>, halogen, -C(p)<sub>3</sub>, or -O-C(p)<sub>3</sub> where p is halogen, and said cycloalkyl, aryl or heteroaryl groups can alternatively or additionally be optionally substituted with up to four alkyl substituents in any position;

iv) R<sub>4</sub> is C<sub>1-6</sub> alkyl, C<sub>2-6</sub> alkenyl, or cycloalkyl;

v) A is C(=O), C(=S) or SO<sub>2</sub>;

vi) B is L<sub>1</sub> or L<sub>2</sub>;

L<sub>1</sub> is:



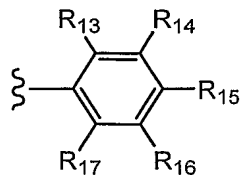
q is 0 or 1;

m is 0 or 1;

n is 0 or 1;

R<sub>11</sub> and R<sub>12</sub> are each independently H, straight chain or branched C<sub>1-6</sub> alkyl, C<sub>2-6</sub> alkenyl, or cycloalkyl;

-225-

Q<sub>1</sub> is:

wherein:

R<sub>13</sub>, R<sub>14</sub>, R<sub>15</sub>, R<sub>16</sub> and R<sub>17</sub> are each independently H, halogen, CN, NR<sub>8</sub>R<sub>9</sub>, COOR<sub>10</sub>, SR<sub>10</sub>, straight chain or branched C<sub>1-6</sub> alkyl, C<sub>2-6</sub> alkenyl, C<sub>2-6</sub> alkynyl, cycloalkyl, aryl, alkylaryl, arylalkyl or heteroaryl, wherein each of said alkoxy carbonyl, straight chain or branched C<sub>1-6</sub> alkyl, C<sub>2-6</sub> alkenyl, C<sub>2-6</sub> alkynyl, cycloalkyl, aryl, alkylaryl, arylalkyl or heteroaryl groups can be optionally substituted with up to four substituents in any position selected from NO<sub>2</sub>, OR<sub>10</sub>, NR<sub>8</sub>R<sub>9</sub>, halogen, -C(p)<sub>3</sub>, or -O-C(p)<sub>3</sub> where p is halogen, and said cycloalkyl, aryl, alkylaryl, arylalkyl or heteroaryl groups can alternatively or additionally be optionally substituted with up to four alkyl substituents in any position;

L<sub>2</sub> is -O-Q<sub>2</sub> wherein Q<sub>2</sub> is straight chain or branched C<sub>1-6</sub> alkyl,

C<sub>2-6</sub> alkenyl, C<sub>2-6</sub> alkynyl, cycloalkyl, aryl, alkylaryl, arylalkyl, wherein each of said cycloalkyl, aryl, alkylaryl, or arylalkyl groups can be optionally substituted with up to four substituents in any position selected from NO<sub>2</sub>, OR<sub>7</sub>, halogen, -C(p)<sub>3</sub>, or -O-C(p)<sub>3</sub> where p is halogen, or an aliphatic or aromatic heterocycle, and said cycloalkyl, aryl, alkylaryl, and arylalkyl groups can alternatively or additionally be optionally substituted with up to four alkyl substituents in any position; or a pharmaceutically acceptable salt.

132. A pharmaceutical composition comprising a compound of any one of the claims 1, 41-45, 88 and 128.

133. A method for the prophylaxis or treatment of reducing platelet aggregation in a patient in need of said prophylaxis or treatment comprising administering a pharmaceutically effective amount of a compound according to any one of claims 1, 41 to 45 and 88 or a pharmaceutical composition according to claim 132.

-226-

- 1 134. A method for the prophylaxis or treatment of any one of the group of indications consisting of  
2 coronary artery disease, myocardial infarction, transient ischemic attack, angina, stroke and atrial  
3 fibrillation in a patient in need of said prophylaxis or treatment comprising administering a  
4 pharmaceutically effective amount of a compound according to any one of claims 1, 41 to 45 and  
5 88 or a pharmaceutical composition according to claim 132.
- 1 135. A method for the prophylaxis or treatment of reducing risk of blood clot formation in an  
2 angioplasty or coronary bypass in a surgery patient in need of such prophylaxis or treatment  
3 comprising administering a pharmaceutically effective amount of a compound according to any  
4 one of claims 1, 41 to 45 and 88 or a pharmaceutical composition according to claims 132.
- 1 136. A method for the prophylaxis or treatment of reducing risk of blood clot formation in a patient  
2 suffering from atrial fibrillation comprising administering to said patient in need thereof a  
3 pharmaceutically effective amount of a compound according to any one of claims 1, 41 to 45 and  
4 88 or a pharmaceutical composition according to claim 132.
- 1 137. A method for the prophylaxis or treatment of asthma in a patient in need of said prophylaxis or  
2 treatment comprising administering a pharmaceutically effective amount of a compound  
3 according to any one of claims 1, 41 to 45 and 88 or a pharmaceutical composition according to  
4 claim 132.
- 1 138. A method for the prophylaxis or treatment of a symptom of asthma in a patient in need of said  
2 prophylaxis or treatment comprising administering a pharmaceutically effective amount of a  
3 compound according to any one of claims 1, 41 to 45 and 88 or a pharmaceutical composition  
4 according to claim 132.
- 1 139. A method for the prophylaxis or treatment of agitation or a symptom thereof in a patient in need  
2 of said prophylaxis or treatment comprising administering a pharmaceutically effective amount of  
3 a compound according to any one of claims 1, 41 to 45 and 88 or a pharmaceutical composition  
4 according to claim 132.
- 1 140. The method of claim 139 wherein said patient is a cognitively intact elderly patient.



-227-

- 1 141. A method for the prophylaxis or treatment of agitation or a symptom thereof in a patient suffering  
2 from dementia, comprising administering to said patient in need thereof a pharmaceutically  
3 effective amount of a compound according to any one of claims 1, 41 to 45 and 88 or a  
4 pharmaceutical composition according to claim 132.
- 1 142. The method of claim 141 wherein said dementia is due to a degenerative disease of the nervous  
2 system.
- 1 143. The method of claim 141 wherein said dementia is Alzheimers disease, Lewy Body, Parkinson's  
2 disease, or Huntington's disease.
- 1 144. The method of claim 141 wherein said dementia is due to diseases that affect blood vessels.
- 1 145. The method of claim 141 wherein said dementia is due to stroke or multi-infarct dementia.
- 1 146. A method for the prophylaxis or treatment of a behavioral disorder, drug induced psychosis,  
2 excitative psychosis, Gilles de la Tourette's syndrome, manic disorder, organic or NOS psychosis,  
3 psychotic disorder, psychosis, acute schizophrenia, chronic schizophrenia, or NOS schizophrenia  
4 comprising administering to said patient in need thereof a dopamine D2 receptor antagonist and a  
5 according to any one of claims 1, 41 to 45 and 88 or a pharmaceutical composition according to  
6 claim 132.
- 1 147. The method of claim 146 wherein said dopamine D2 receptor antagonist is haloperidol.
- 1 148. A method for the prophylaxis or treatment of infantile autism, huntington's chorea, or nausea and  
2 vomiting from chemotherapy or chemotherapeutic antibodies comprising administering to said  
3 patient in need thereof a dopamine D2 receptor antagonist and a compound according to any one  
4 of claims 1, 41 to 45 and 88 or a pharmaceutical composition according to claim 132.
- 1 149. The method of claim 148 wherein said dopamine D2 receptor antagonist is haloperidol.

-228-

- 1 150. A method for the prophylaxis or treatment of schizophrenia in a patient, comprising administering  
2 to said patient in need thereof a dopamine D2 receptor antagonist and a compound according to  
3 any one of claims 1, 41 to 45 and 88 or a pharmaceutical composition according to claim 132.
- 1 151. The method of claim 150 wherein said dopamine D2 receptor antagonist is haloperidol.
- 1 152. A method for the prophylaxis or treatment of alleviating negative symptoms of schizophrenia  
2 induced by the administration of haloperidol to a patient suffering from said schizophrenia,  
3 comprising administering to said patient in need thereof a compound according to any one of  
4 claims 1, 41 to 45 and 88 or a pharmaceutical composition according to claim 132.
- 1 153. The method of any one of claims 147, 149, 151 and 152 wherein said haloperidol and said  
2 compound are administered in separate dosage forms.
- 1 154. The method of any one of claims 147, 149, 151 and 152 wherein said haloperidol and said  
2 compound are administered in a single dosage form.
- 1 155. Use of a compound according to any one of claims 1, 41 to 45, 88 and 128 for production of a  
2 medicament for use in prophylaxis or treatment of a 5-HT<sub>2A</sub> related disorder.
- 1 156. The use according to claim 155 wherein the 5-HT<sub>2A</sub> related disorder is reducing platelet  
2 aggregation in a patient in need of said prophylaxis or treatment.
- 1 157. The use according to claim 155 wherein the 5-HT<sub>2A</sub> related disorder is any one of the group of  
2 indications consisting of coronary artery disease, myocardial infarction, transient ischemic attack,  
3 angina, stroke and atrial fibrillation in a patient in need of said prophylaxis or treatment.
- 1 158. The use according to claim 155 wherein the 5-HT<sub>2A</sub> related disorder is reducing risk of blood clot  
2 formation in an angioplasty or coronary bypass in a surgery patient in need of such prophylaxis or  
3 treatment.
- 1 159. The use according to claim 155 wherein the 5-HT<sub>2A</sub> related disorder is reducing risk of blood clot  
2 formation in a patient suffering from atrial fibrillation.

-229-

- 1 160. The use according to claim 155 wherein the 5-HT<sub>2A</sub> related disorder is asthma.
- 1 161. The use according to claim 155 wherein the 5-HT<sub>2A</sub> related disorder is agitation.
- 1 162. The use according to claim 155 wherein the 5-HT<sub>2A</sub> related disorder is dementia.
- 1 163. The use according to claim 155 wherein the 5-HT<sub>2A</sub> related disorder is Alzheimers disease, Lewy  
2 Body, Parkinson's disease, or Huntington's disease.
- 1 164. The use according to claim 155 wherein the 5-HT<sub>2A</sub> related disorder is a behavioral disorder, drug  
2 induced psychosis, excitative psychosis, Gilles de la Tourette's syndrome, manic disorder, organic  
3 or NOS psychosis, psychotic disorder, psychosis, acute schizophrenia, chronic schizophrenia, or  
4 NOS schizophrenia.
- 1 165. The use according to claim 155 wherein the 5-HT<sub>2A</sub> related disorder is infantile autism,  
2 huntington's chorea, or nausea and vomiting from chemotherapy or chemotherapeutic antibodies.
- 1 166. The use according to claim 155 wherein the 5-HT<sub>2A</sub> related disorder is schizophrenia.

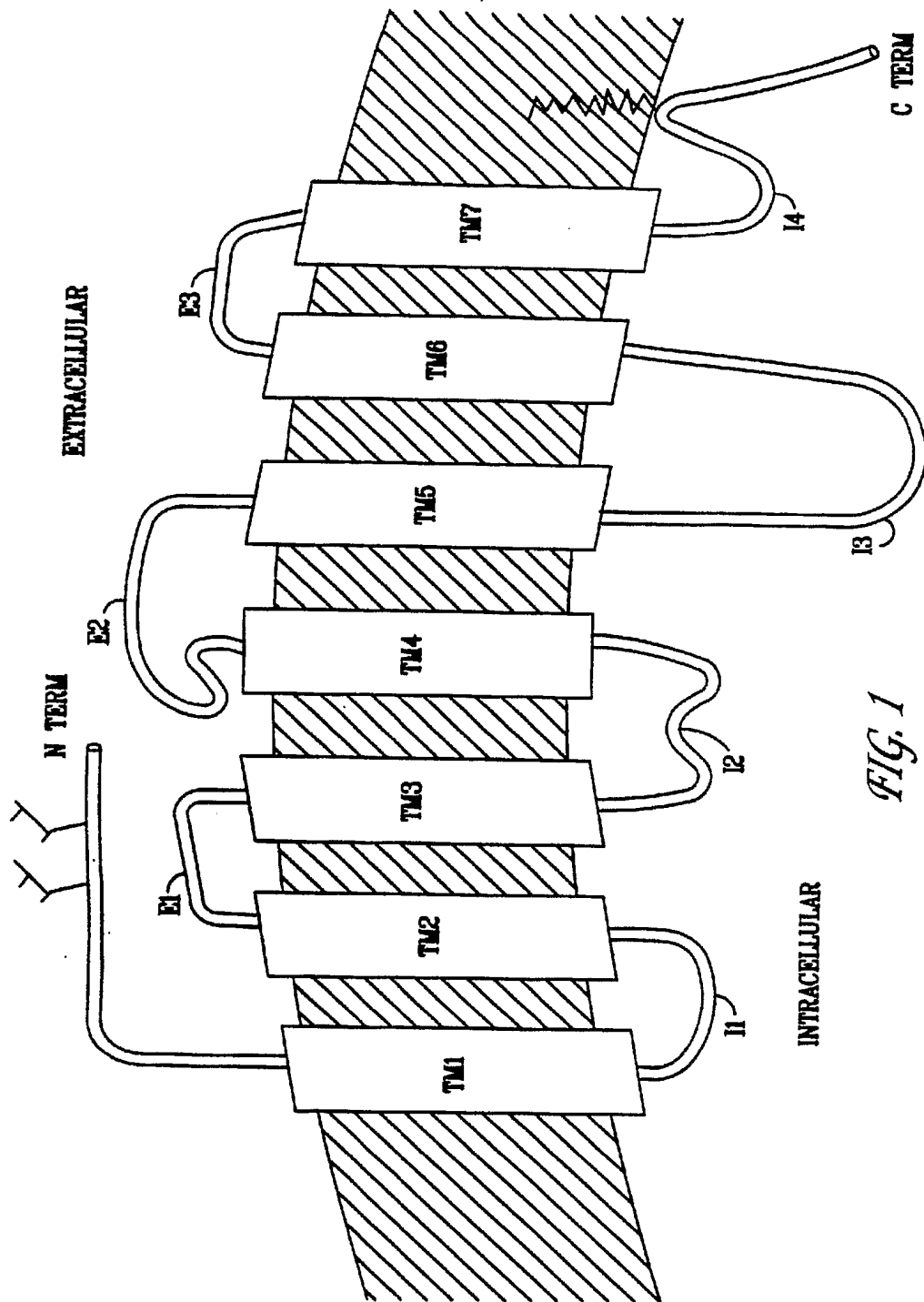


FIG. 1

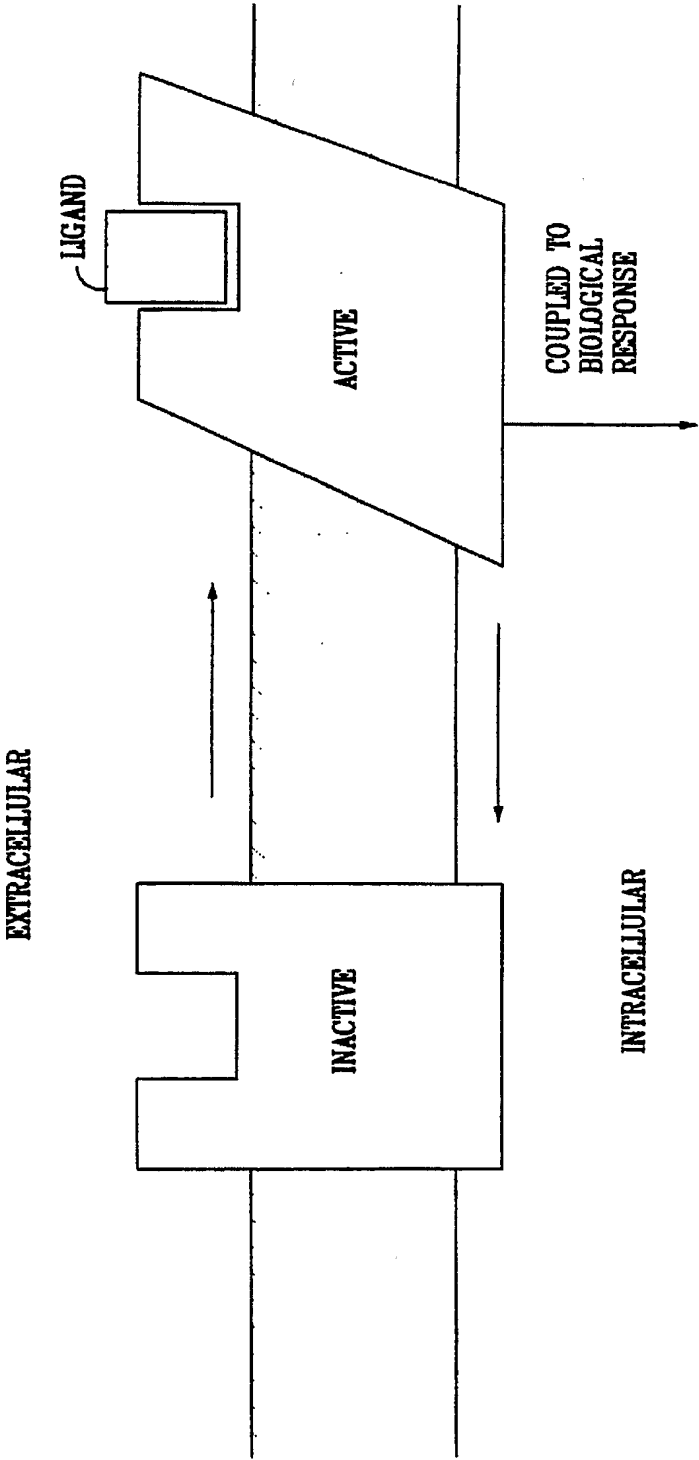


FIG. 2

*FIG. 3A*

ATGGATATTCTTTGTGAAGAAAATACTTCTTTGAGCTCAACTACGAACTCCCTAATGCAATTA  
AATGATGACAACAGGCTCTACAGTAATGACTTTAACTCCGGAGAAGCTAACACTTCTGATGCA  
TTTAACTGGACAGTCGACTCTGAAAATCGAACC AACCTTTCTGTGAAGGGTGCCCTCTCACCG  
TCGTGTCTCTCCTTACTTCATCTCCAGGAAAAAACTGGTCTGCTTTACTGACAGCCGTAGTGA  
TTATTCTAACTATTGCTGGAAACATACTCGTCATCATGGCAGTGTCCCTAGAGAAAAAGCTGC  
AGAATGCCACCAACTATTTCTGTATGTCACCTTGCCATAGCTGATATGCTGCTGGGTTTCCTTGT  
CATGCCCGTGTCCATGTTAACCATCCTGTATGGGTACCGGTGGCCTCTGCCGAGCAAGCTTTGT  
GCAGTCTGGATTTACCTGGACGTGCTCTTCTCCACGGCCTCCATCATGCACCTCTGCGCCATCT  
CGCTGGACCGCTACGTGCGCATCCAGAATCCCATCCACCACAGCCGCTTCAACTCCAGAACTA  
AGGCATTTCTGAAAATCATTGCTGTTTGGACCATATCAGTAGGTATATCCATGCCAATACCAG  
TCTTTGGGCTACAGGACGATTCTGAAGGTCTTTAAGGAGGGGAGTTGCTTACTCGCCGATGATA  
ACTTTGTCTGTATCGGCTCTTTTGTGTCATTTTTCATTCCTTAACCATCATGGTGATCACCTAC  
TTTCTAACTATCAAGTCACTCCAGAAAGAAGCTACTTTGTGTGTAAGTGATCTTGGCACACGG  
GCCAAATTAGCTTCTTTTTCAGCTTCTCTCCCTCAGAGTTCTTTGTCTTCAGAAAAGCTCTTCCAGC  
GGTCGATCCATAGGGAGCCAGGGTCTACACAGGCAGGAGGACTATGCAGTCCATCAGCAAT  
GAGCAAAAGGCATGCAAGGTGCTGGGCATCGTCTTCTTCTCTGTTTGTGGTGATGTGGTGCCCT  
TTCTTCATCACAAACATCATGGCCGTCATCTGCAAAGAGTCTTGCAATGAGGATGTCATTGGG  
GCCCTGCTCAATGTGTTTGTGTTGGATCGGTTATCTCTTTCAGCAGTCAACCCACTAGTCTACA  
CACTGTTCAACAAGACCTATAGGTCAGCCTTTTACGGTATATTTCAGTGTCTAGTACAAGGAAA  
ACAAAAAACCATTGCAGTTAATTTTAGTGAACACAATACCGGCTTTGGCCTACAAGTCTAGCC  
AACTTCAAATGGGACAAAAAAGAATTCAAAGCAAGATGCCAAGACAACAGATAATGACTGC  
TCAATGGTTGCTCTAGGAAAGCAGTATTCTGAAGAGGCTTCTAAAGACAATAGCGACGGAGT  
GAATGAAAAGGTGAGCTGTGTGTGA

*FIG. 3B*

MDILCEENTSLSSTTNSLMQLNDDNRLYSNDFNSGEANTSDAFNWTVDSENRTNLSCEGCLSPSCL  
SLHLQEKNSALLTAVVILTIAGNILVMAVSLEKKLNATNYFLMSLAIDMLLGFLVMPVSM  
LTILYGYRWPLPSKLCVWYLDVLFSTASIMHLCAISLDRYVAIQNPIHHSRFNSRTKAFLKIIAVW  
TISVGISMPIPVFGLQDDSKVFKEGSCILLADDNFVLIGSFVSFFIPLTMVITYFLTIKSLQKEATLCVS  
DLGTRAKLASFSFLPQSSLSSEKLFQRSIHREPGSYTGRRTMQSISNEQKACKVLGIVFFLFVVMWC  
PFFITNMAVICKESCNEVDIGALLNVFVWIGYLSSAVNPLVYTLFNKTYRSAFSRYICQYKENKK  
PLQLLVNTIPALAYKSSQLQMGQKKNKQDAKTDDNDCSMVALGKQYSEEASKDNSDGVNEKV  
SCV

*FIG. 4B*

MVNLRNAVHSFLVHLIGLLVWQCDISVSPVAAIVTDIFNTSDGGRFKFPDGVQNWPAISIVIIIMTIGGN  
ILVMAVSMEEKLHNATNYFLMSLAIDMLVGLLVMPLSLLAILDYVWPLPRYLCPVWISLDVLFSTASI  
MHLCAISLDRYVAIRNPIEHSRFNSRTKAIMKIAVWASIGVSVPVIGLRDEEKVFNNTTCVLNDPN  
FVLIGSFVAFFIPLTMVITYCLITYVLRQALMLLHGHTTEPPGLSLDFLKCKRNTAEENSANPNQDQ  
NARRRKKKERRPRGTMQAINNERKASKVLGIVFFVFLMWCPFFITNLSVLCEKSCNQKMEKLLNVFVW  
IGYVCSGINPLVYTLFNKTYRRAFSNYLCNYKVEKKPPVRQIPRVAATALS GRELVNIYRHTNEPVIEK  
ASDNEPGIEMQVENLELPVNPSSVVSERISSV

*FIG. 4A*

ATGGTGAACCTGAGGAATGCGGTGCATTTCATTCCCTGTGTCACCTAATTGGCCTATTGGTTTGGC  
AATGTGATATTTCTGTGAGCCCAGTAGCAGCTATAGTAACTGACATTTCAATACCTCCGATG  
GTGGACGCTTCAAATTCCCAGACGGGGTACAAAACCTGGCCAGCACTTTCAATCGTCATCATAA  
TAATCATGACAATAGGTGGCAACATCCTTGTGATCATGGCAGTAAGCATGGAAGAAAGAACTG  
CACAATGCCACCAATTACTTCTTAATGTCCCTAGCCATTGCTGATATGCTAGTGGGACTACTTG  
TCATGCCCCGTCTCTCCTGGCAATCCTTTATGATTATGTCTGGCCACTACCTAGATATTTGTG  
CCCCGTCTGGATTCTTTAGATGTTTTATTTTCAACAGCGTCCATCATGCACCTCTGCGCTATAT  
CGCTGGATCGGTATGTAGCAATACGTAATCCTATTGAGCATAGCCGTTTCAATTCGCGGACTA  
AGGCCATCATGAAGATTGCTATTGTTTGGGCAATTTCTATAGGTGTATCAGTTCCTATCCCTGT  
GATTGGACTGAGGGACGAAGAAAAGGTGTTCTGTAACAACACGACGTGCGTGCTCAACGACC  
CAAATTTCTGTTCTTATTGGGTCTTCGTAGCTTTCTTCATACCGCTGACGATTATGGTGATTAC  
GTATTGCCTGACCATCTACGTTCTGCGCCGACAAGCTTTGATGTTACTGCACGGCCACACCGA  
GGAACCGCCTGGACTAAGTCTGGATTTCCTGAAGTGCTGCAAGAGGAATACGGCCGAGGAAG  
AGAACTCTGCAAAACCCTAACCAAGACCAGAACGCACGCCGAAGAAAGAAGAAGGAGAGACG  
TCCTAGGGGCACCATGCAGGCTATCAACAATGAAAGAAAAGCTTCGAAAGTCCTTGGGATTG  
TTTTCTTTGTGTTTCTGATCATGTGGTGCCCATTTTTTCATTACCAATATTCTGTCTGTTCTTTGTG  
AGAAGTCTGTAACCAAAAAGCTCATGGAAGGCTTCTGAATGTTGTTGTTGGATTGGCTAG  
TTTGTTTCAGGAATCAATCCTCTGGTGTATACTCTGTTCAACAAAATTTACCGAAGGGCATTCTC  
CAACTATTTGCGTTGCAATTATAAGGTAGAGAAAAGCCTCCTGTCAGGCAGATTCCAAGAGT  
TGCCGCCACTGCTTTGTCTGGGAGGGAGCTTAATGTTAACATTTATCGGCATACCAATGAACC  
GGTGATCGAGAAAGCCAGTGACAATGAGCCCGGTATAGAGATGCAAGTTGAGAATTTAGAGT  
TACCAGTAAATCCCTCCAGTGTGGTTAGCGAAAGGATTAGCAGTGTGTGA



*FIG. 5A*

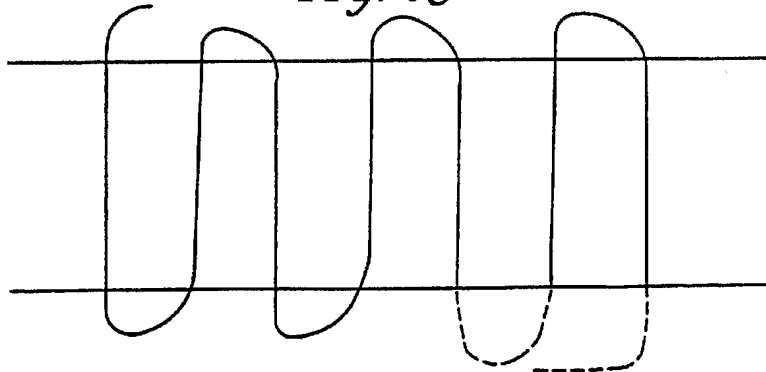
ATGGTGAACCTGAGGAATGCGGTGCATTTCCTTGTGCACCTAATTGGCCTATTGGTTTGGCAAT  
GTGATATTTCTGTGAGCCCAGTAGCAGCTATAGTAACTGACATTTTCAATACCTCCGATGGTGGACG  
CTTCAAATTTCCAGACGGGGTACAAAACCTGGCCAGCACTTTCATCGTCATCATAATAATCATGAC  
AATAGGTCGCAACATCCTTGTGATCATGGCAGTAAGCATGGAAGAAAGAACTGCACAATGCCACCA  
ATTACTTCTTAATGTCCCTAGCCATTGCTGATATGCTAGTGGGACTACTTGTTCATGCCCCGTCTCTCT  
CTGGCAATCCTTTATGATTATGTCTGGCCATCAACTAGATATTTGTGCCCCGTCTGGATTTCCTTTAGA  
TGTTTTATTTTCAACAGCGTCCATCATGCACCTCTGCGCTATATCGCTGGATCGGTATGTAGCAATA  
CGTAATTCTATTGAGCATAGCCGTTTCAATTCGCGGACTAAGGCCATCATGAAGATTGCTATTGTTT  
GGGCAATTTCTATAGGTGTATCAGTTCCTATCCCTGTGATTGGACTGAGGGACGAAGAAAAGGTGT  
TCGTGAACAACACGACGTGCGTGCTCAACGACCCAAATTTGCTTCTTATTGGGTCCTTCGTAGCTTT  
CTTCATACCGCTGACGATTATGGTGATTACGTATTGCCTGACCATCTACGTTCTGCGCCGACAAGCT  
TTGATGTTACTGCACGGCCACACCGAGGAACCGCCTGGACTAAGTCTGTATTTCTGAACTGCTGC  
AAGAGGAATACGGCCGAGGAAGAGAAGCTCTGCAAACCTAACCAGACCAGAACGCACGCCGAA  
GAAAGAAGAAGGAGAGACGTCCTAGGGGCACCATGCAGGCTATCAACAATGAAAGAAAAGCTAA  
GAAAGTCCTTGGGATTGTTTTCTTTGTGTTTCTGATCATGTGGTGCCCATTTTTCATTACCAATATTC  
TGCTGTTCCTTTGTGAGAAGTCCTGTAACCAAAAAGCTCATGGAAGGCTCTGAATGTGTTTGTG  
GATTGGCTATGTTTGTTCAGGATTCAATCCTCTGGTGATATCTCTGTTCAACAAAATTTACCGAAGG  
GCATTCTCCAACTATTTGCGTTGCAATTATAAGGTAGAGAAAAGCCCTCCTGTCAGGCAGATTCCA  
AGAGTTGCCGCCACTGCTTTGTCTGGGAGGGAGCTTATTGTTAACATTTATCGGCATACCAATGAA  
CCGGTGATCGAGAAAGCCAGTGACAATGAGCCCGGTATAGAGATGCAAGTTGAGAATTTAGAGTT  
ACCAGTAAATCCCTCCAGTGTGGTTAGCGAAAGGATTAGCAGTGTGTGA

*FIG. 5B*

MVNLRNAVHSFLVHLIGLLVWQCDISVSPVAAIVTDIFNTSDGGRFKFPDGVQNWPAISIVIIIMTI  
 GGNILVIMAVSMEKKLHNATNYFLMSLAIDMLVGLLVMPLSLLAILDYVWPLPRYLCPVWISL  
 DVLFTASIMHLCAISLDRYVAIRNPIEHSRFSRNTKAIMKIAIVWAISIGVSVPIPVIGLRDEEKVFW  
 NNTTCVLNDPNFVLIGSFVAFPIPLTIMVITYCLTIYVLRQALMLLHGHTTEPPGLSDFLKCKKRN  
 TAEENSANPNQDQNAARRRKKKERRPRGTMQAINNERKAKKVLGIVFFVFLMWCPFFITNLSVL  
 CEKSCNQKLMKLLNVFVWIGYVCSGINPLVYTLFNKIYRRAFSNYLRCNYKVEKKPPVRQIPRV  
 AATALSGRENLVNVIYRHTNEPVIEKASDNEPGIEMQVENLELPVNPSSVVSERISSV

*FIG. 6B*

MDILCEENTSLSSITNSLMQLNDDNRLYSNDFNSGEANTSDAFNWTVDSENRTNLSCEGCLSPSCL  
 SLLHLQEKNWSALLTAVVILLTIAGNILVIMAVSLEKKLQNAATNYFLMSLAIDMLLGLFVMPVSM  
 LTILYGYRWPLPSKLCVWYLDVLFTASIMHLCAISLDRYVAIQNPIHHSRFSRNTKAFLKIAVW  
 TISVGISMPIPVFGLQDDSKVFKEGSCILLADNDFVLIGSFVSFFIPLTIMVITYFLTIVLRRQALMLL  
 HGHTTEPPGLSDFLKCKKRN TAEENSANPNQDQNAARRRKKKERRPRGTMQAINNERKAS  
 KVLGIVFFLVVWCPFFITNMAVICKESCNEGVIGALLNVFVWIGYLSSAVNPLVYTLFNKIYR  
 RAFSNYLRCNYKVEKKPPVRQIPRVAATALSGRENLVNVIYRHTNEPVIEKASDNEPGIEMQVE  
 NLELPVNPSSVVSERISSV

*FIG. 6C*

*FIG. 6A*

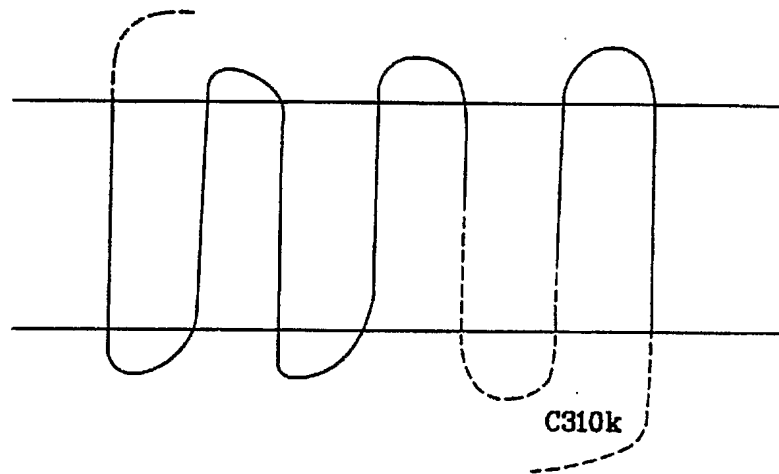
ATGGATATTCTTTGTGAAGAAAATACTTCTTTGAGCTCAACTACGAACCCCTAATGCAATTA  
AATGATGACAACAGGCTCTACAGTAATGACTTTAACTCCGGAGAAGCTAACACTTCTGATGCA  
TTTAACTG-GACAGTCGACTCTGAAAATCGAACCAACCTTTCTGTGAAGGGTGCTCTCACCG  
TCGTGTCCTCTCTTACTTCATCTCAGGAAAAAACTGGTCTGCTTTACTGACAGCCGTAGTGA  
TTATTCCTAACTATTGCTGGAAACATACTCGTCATCATGGCAGTGTCCCTAGAGAAAAAGCTGC  
AGAATGCCACCAACTATTTCTGTATGTCACTTGCCATAGCTGATATGCTGCTGGGTTTCTTGT  
CATGCCCCGTGTCATGTTAACCATCCTGTATGGGTACCGGTGGCCTCTGCCGAGCAAGCTTTGT  
GCAGTCTGGATTTACCTGGACGTGCTCTTCTCCACGGCCTCCATCATGCACCTCTGCGCCATCT  
CGCTGGACCGCTACGTCGCCATCCAGAATCCCATCCACCACAGCCGCTTCAACTCCAGAACTA  
AGGCATTTCTGAAAATCATTGCTGTTTGGACCATATCAGTAGGTATATCCATGCCAATACCAG  
TCTTTGGGCTACAGGACGATTTCGAAGGTCTTTAAGGAGGGGAGTTGCTTACTCGCCGATGATA  
ACTTTGTCTGATCGGCTCTTTTGTGTCATTTTTCATTCCCTTAACCATCATGGTGATCACCTAC  
TTTCTAACTATCAAGGTTCTGCGCCCGACAAGCTTTGATGTTACTGCACGGCCACACCGAG  
GAACCGCCTGGACTAAGTCTGGATTTCTGAAGTGCTGCAAGAGGAATACGGCCGAGGA  
AGAGAACTCTGCAAAACCCTAACCAGACCAGAACGCACGCCGAAGAAAGAAGAAGGAG  
AGACGTCTAGGGGCACCATGCAGGCTATCAACAATGAAAGAAAAGCTTCGAAGGTACT  
GGGCATCGTCTTCTTCTGTTTGTGGTGATGTGGTGCCCTTCTTCATCACAAACATCATGGCC  
GTCATCTGCAAAGAGTCTGCAATGAGGATGTCATTGGGGCCCTGCTCAATGTGTTGTTTGG  
ATCGGTTATCTCTCTTCAGCAGTCAACCCACTAGTCTATACTCTGTTCAACAAAATTTACCGA  
AGGGCATTCTCCAATAATTGCGTTGCAATTATAAGGTAGAGAAAAAGCCTCCTGTCAG  
GCAGATTCCAAGAGTTGCCGCCACTGCTTTGTCTGGGAGGGAGCTTAATGTTAACATTT  
ATCGGCATACCAATGAACCGGTGATCGAGAAAGCCAGTGACAATGAGCCCGGTATAGAG  
ATGCAAGTTGAGAATTTAGAGTTACAGTAAATCCCTCCAGTGTGGTTAGCGAAAGGAT  
TAGCAGTGTGTGA

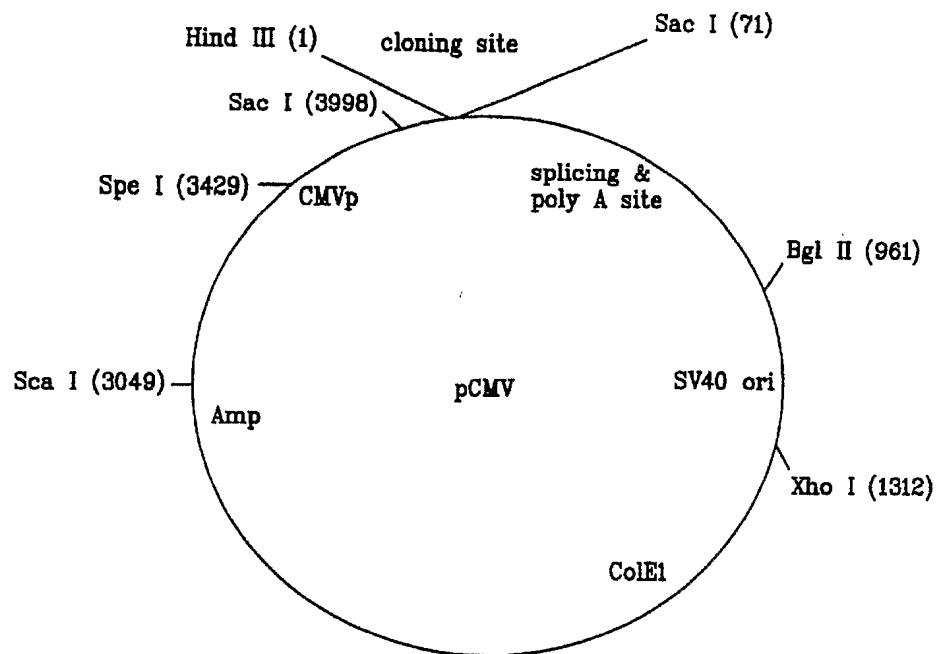
*FIG. 7A*

ATGGATATTCTTTGTGAAGAAAATACTTCTTTGAGCTCAACTACGAACTCCCTAATGCAATTA  
AATGATGACAACAGGCTCTACAGTAATGACTTTAACTCCGGAGAAGCTAACACTTCTGATGCA  
TTAACTGGACAGTCGACTCTGAAAATCGAACCAACCTTTCTGTGAAGGGTGCCCTCACCG  
TCGTGTCTCTCCTTACTTCATCTCCAGGAAAAAACTGGTCTGCTTTACTGACAGCCGTAGTGA  
TTATTCTAACTATTGCTGGAACATACTCGTCATCATGGCAGTGTCCTAGAGAAAAAGCTGC  
AGAATGCCACCAACTATTTCTGTATGTCACTTGCCATAGCTGATATGCTGCTGGGTTTCCTTGT  
CATGCCCGTGTCCATGTTAACCATCCTGTATGGGTACCGGTGGCCTCTGCCGAGCAAGCTTTGT  
GCAGTCTGGATTTACCTGGACGTGCTCTTCTCCACGGCCTCCATCATGCACCTCTGCGCCATCT  
CGCTGGACCGCTACGTGCGCCATCCAGAATCCCATCCACCACAGCCGCTTCAACTCCAGAACTA  
AGGCATTTCTGAAAATCATTGCTGTTTGGACCATATCAGTAGGTATATCCATGCCAATACCAG  
TCTTTGGGCTACAGGACGATTCTGAAGGTCTTTAAGGAGGGGAGTTGCTTACTCGCCGATGATA  
ACTTTGTCCTGATCGGCTCTTTTGTGTCATTTTTCATTCCCCTGACGATTATGGTGATTACGT  
ATTGCCTGACCATCTACGTTCTGCGCCGACAAGCTTTGATGTTACTGCACGGCCACACC  
GAGGAACCGCCTGGACTAAGTCTGGATTTCTGAAGTGCTGCAAGAGGAATACGGCCGA  
GGAAGAGAACTCTGCAAAACCCTAACCAAGACCAGAACGCACGCCGAAGAAAGAAGAAG  
GAGAGACGTCCTAGGGGCACCATGCAGGCTATCAACAATGAAAGAAAAGCTAAGAAAAGT  
CCTTGGGATTGTTTTCTTTGTGTTTCTGATCATGTGGTGCCCTTTCTTCATCACAAACATCA  
TGGCCGTCATCTGCAAAGAGTCCTGCAATGAGGATGTCATTGGGGCCCTGCTCAATGTGTTT  
TTTGATCGGTTATCTCTCTTCAGCAGTCAACCCACTAGTCTATACTCTGTTCAACAAAATT  
ACCGAAGGGCATTCTCCAACCTATTGCGTTGCAATTATAAGGTAGAGAAAAAGCCTCCT  
GTCAGGCAGATTCCAAGAGTTGCCGCCACTGCTTTGTCTGGGAGGGAGCTTAATGTTAA  
CATTTATCGGCATACCAATGAACCGGTGATCGAGAAAGCCAGTGACAATGAGCCCGGTA  
TAGAGATGCAAGTTGAGAATTTAGAGTTACCAGTAAATCCCTCCAGTGTGGTTAGCGAA  
AGGATTAGCAGTGTGTGA

*FIG. 7B*

MDILCEENTSLSSTTNSLMQLNDDNRLYSNDNFNSGEANTSDAFNWTVDSERNTNLSCEGCLSPSCL  
SLLHLQEKNSALLTAVVILTIAGNILVIMAVSLEKKLQATNYFLMSLAIDMLLGFLVMPVSM  
LTILYGYRWPLPSKLCAYWIYLDVLFSTASIMHLCAISLDRYVAIQNPIHRSFNSRRTKAFLKIIAVW  
TISVGISMPIPVFGLQDDSKVFKEGSCLLADDNFVLIGSFVSFFIPLTIMVTTYCLTIYVLRQALML  
LHGHTEEPGLSLDELKCKRNTAEENSANPNODONARRRKKKERRPRGTMQADNNERKA  
KKVLGIVFFVFLMWCPFFITNMAVICKESCNEDEVIGALLNVFVWIGYLSSAVNPLVYTLENKIY  
RRAFSNYLRCNYKVEKKPPVRQIPRVAATLSGRELVNVIYRHTNEPVIEKASDNEPGIEMOV  
ENLELPVNPSSVVSERISSV

*FIG. 7C*



\*Xho I (1312) to Sca I (3049) is identical to pRc/RSV Xho I (3045) to 4782.

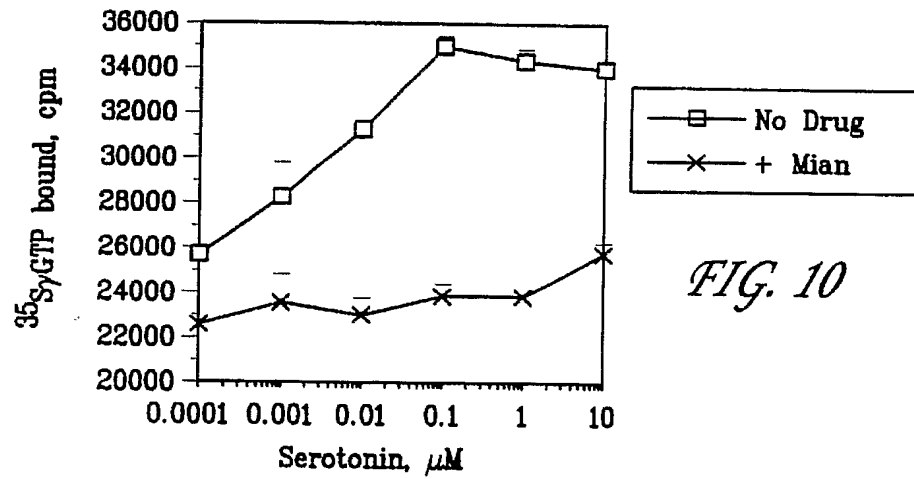
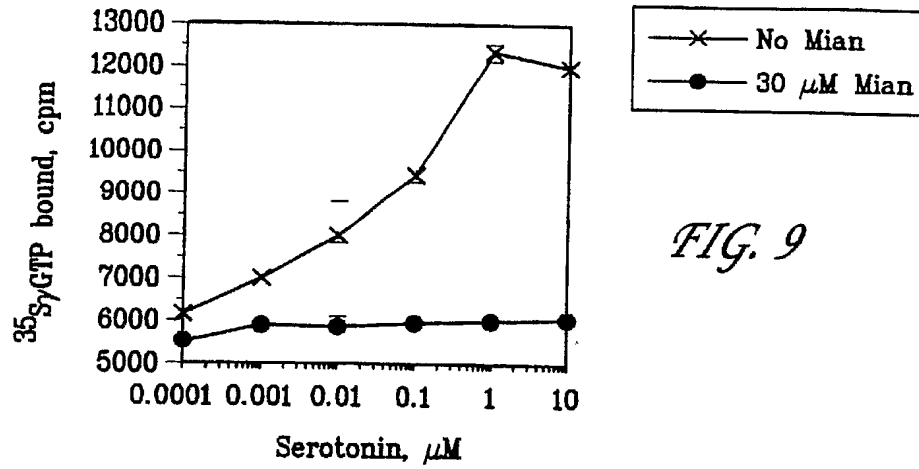
\*Sca I (3049) to 4070 is identical to pCDM7 Amp Scal (2524) to 3545.

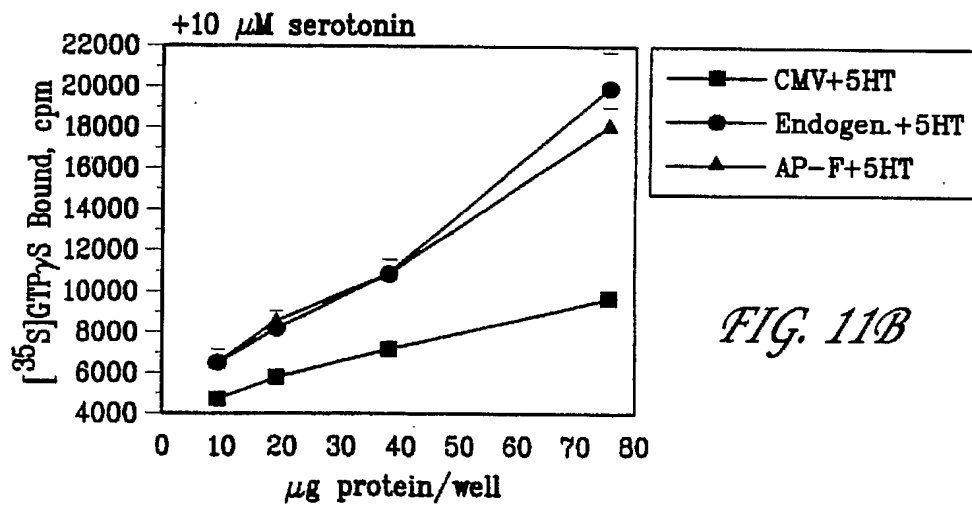
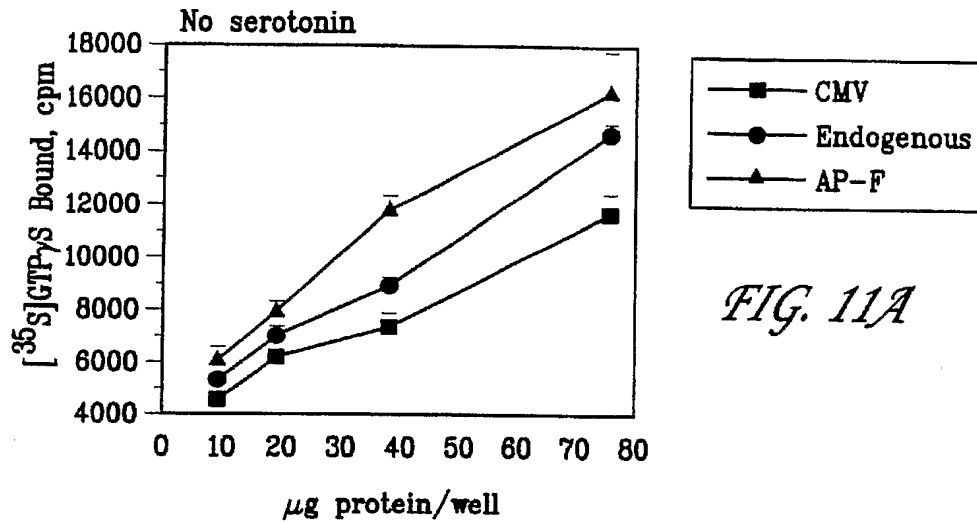
\*multiple cloning site includes Hind III to Sac I of pBluescript II

\*110 to 1312 is identical to pCMD7 Amp 76 to 1278.

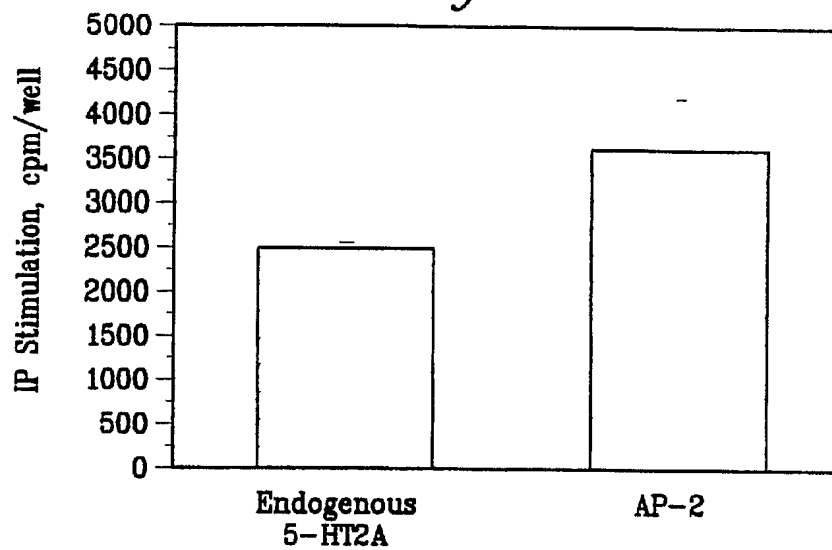
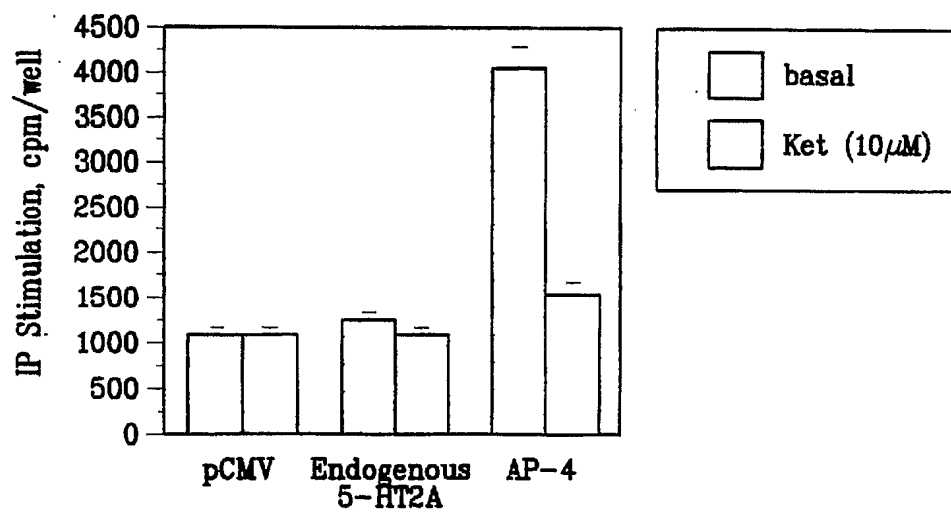
\*Sac I and Spe I in MCS are not unique.

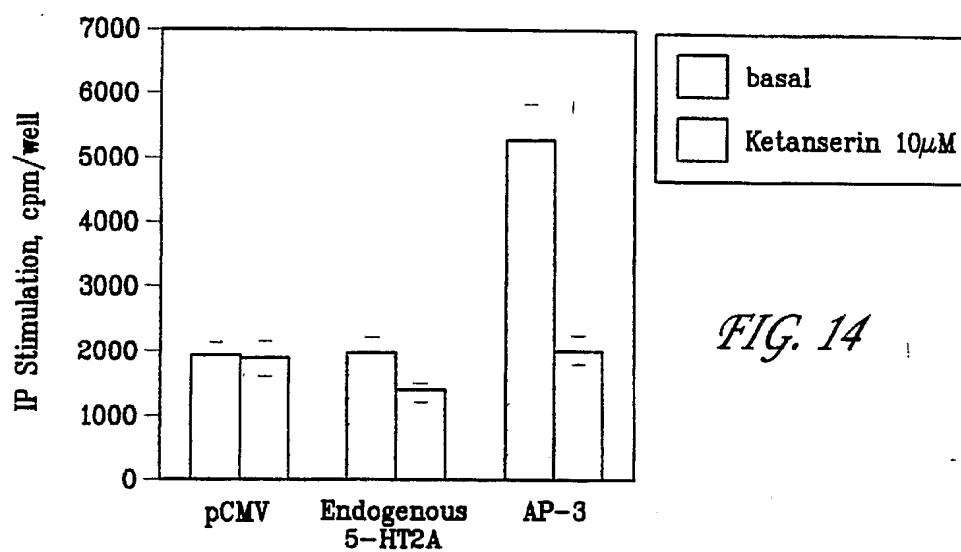
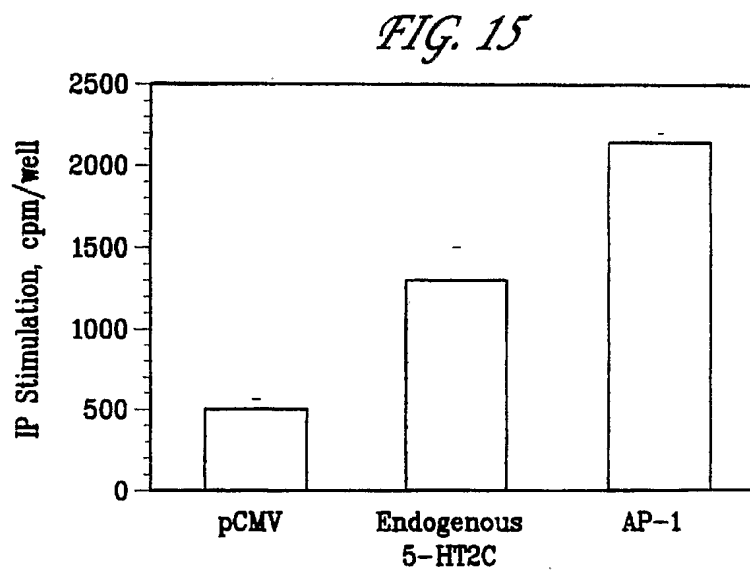
*FIG. 8*

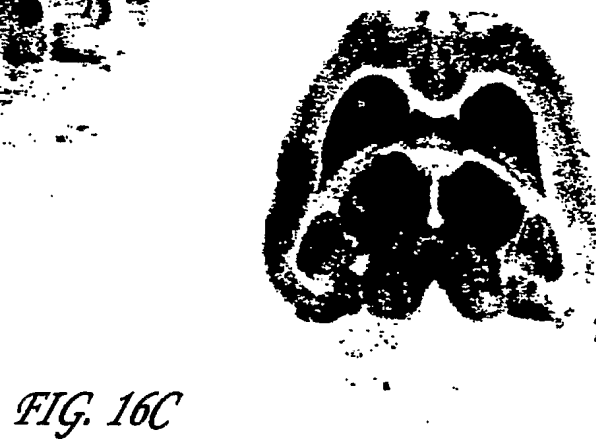
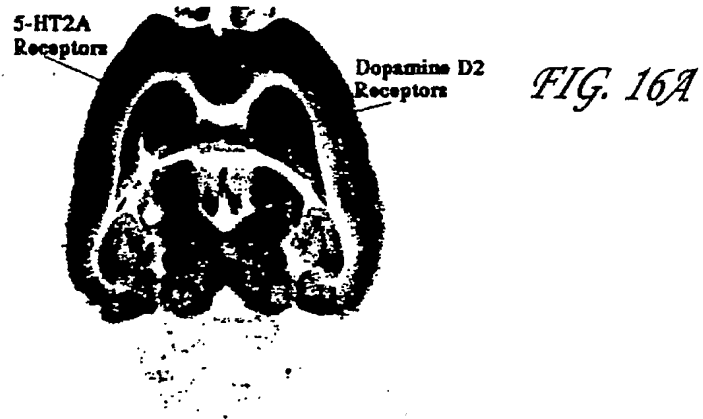




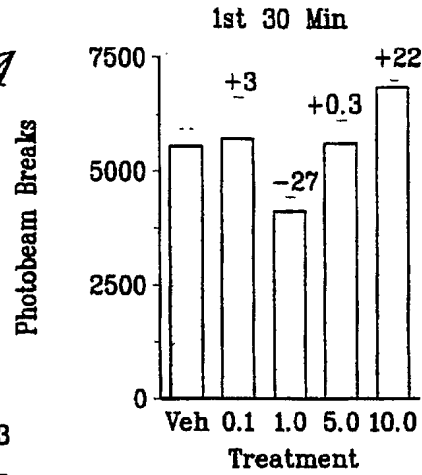


*FIG. 12**FIG. 13*

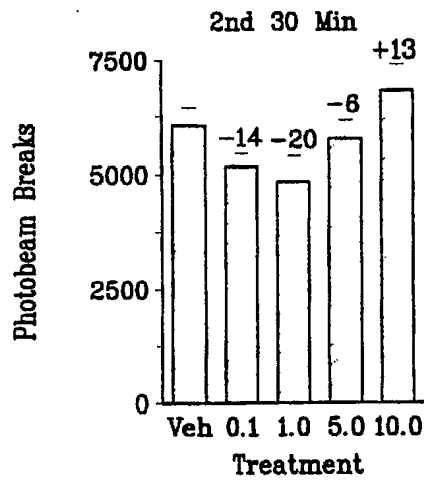
*FIG. 14**FIG. 15*



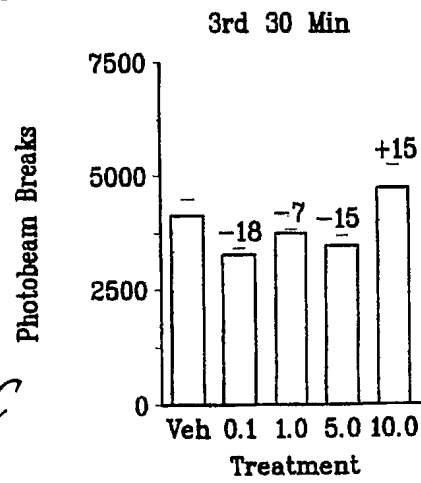
*FIG. 17A*



*FIG. 17B*



*FIG. 17C*



9.WO3  
SEQUENCE LISTING

<110> Arena Pharmaceuticals, Inc.  
Teegarden, Bradley  
Drouet, Keith  
Jayakumar, Honnappa  
Thomsen, William J.  
Maffuid, Paul  
Elwell, Katie  
Foster, Richard J.  
Glen, Robert C.  
Lawless, Michael S.  
Liu, Qian  
Smith, Julian R.  
Feichtinger, Konrad

<120> SMALL MOLECULE MODULATORS OF THE 5-HT<sub>2A</sub> SEROTONIN RECEPTOR  
USEFUL FOR THE PROPHYLAXIS AND TREATMENT OF DISORDERS  
RELATED THERETO

<130> 9.WO3

<160> 31

<170> PatentIn version 3.2

<210> 1  
<211> 28  
<212> DNA  
<213> Artificial

<220>  
<223> Novel sequence

<400> 1  
gacctcgagg ttgcttaaga ctgaagca 28

<210> 2  
<211> 28  
<212> DNA  
<213> Artificial

<220>  
<223> Novel sequence

<400> 2  
atttctagac atatgtagct tgtaccgt 28

<210> 3  
<211> 50  
<212> DNA  
<213> Artificial

<220>  
<223> Novel sequence

<400> 3  
ctaggggac catgcaggct atcaacaatg aaagaaaagc taagaaagtc 50

<210> 4  
<211> 50  
<212> DNA  
<213> Artificial

## 9.W03

<220>  
<223> Novel Sequence

<400> 4  
caaggacttt cttagctttt ctttcattgt tgatagcctg catggtgccc 50

<210> 5  
<211> 26  
<212> DNA  
<213> Artificial

<220>  
<223> Novel Sequence

<400> 5  
gacctcgagt ctttctacac ctcac 26

<210> 6  
<211> 30  
<212> DNA  
<213> Artificial

<220>  
<223> Novel Sequence

<400> 6  
tgctctagat tccagatagg tgaaaacttg 30

<210> 7  
<211> 31  
<212> DNA  
<213> Artificial

<220>  
<223> Novel Sequence

<400> 7  
caaagaaagt actgggcatc gtcttcttcc t 31

<210> 8  
<211> 31  
<212> DNA  
<213> Artificial

<220>  
<223> Novel Sequence

<400> 8  
ccgctcgagt actgcgccga caagctttga t 31

<210> 9  
<211> 38  
<212> DNA  
<213> Artificial

<220>  
<223> Novel Sequence

<400> 9  
cgatgcccag cactttcgaa gcttttcttt cattgttg 38

## 9.W03

<210> 10  
<211> 36  
<212> DNA  
<213> Artificial

<220>  
<223> Novel Sequence

<400> 10  
aaaagcttcg aaagtgctgg gcatcgtctt cttcct 36

<210> 11  
<211> 30  
<212> DNA  
<213> Artificial

<220>  
<223> Novel Sequence

<400> 11  
tgctctagat tccagatagg tgaaaacttg 30

<210> 12  
<211> 19  
<212> DNA  
<213> Artificial

<220>  
<223> Novel Sequence

<400> 12  
cgtgtctctc cttacttca 19

<210> 13  
<211> 36  
<212> DNA  
<213> Artificial

<220>  
<223> Novel Sequence

<400> 13  
tcggcgagcgt actttgatag ttagaaagta ggtgat 36

<210> 14  
<211> 38  
<212> DNA  
<213> Artificial

<220>  
<223> Novel Sequence

<400> 14  
ttctaactat caaagtactg cgccgacaag ctttgatg 38

<210> 15  
<211> 43  
<212> DNA  
<213> Artificial

<220>  
<223> Novel Sequence

## 9.W03

<400> 15  
ttcagcagtc aaccactag tctatactct gttcaacaaa att 43

<210> 16  
<211> 28  
<212> DNA  
<213> Artificial

<220>  
<223> Novel Sequence

<400> 16  
atttctagac atatgtagct tgtaccgt 28

<210> 17  
<211> 19  
<212> DNA  
<213> Artificial

<220>  
<223> Novel Sequence

<400> 17  
atcacctact ttctaacta 19

<210> 18  
<211> 33  
<212> DNA  
<213> Artificial

<220>  
<223> Novel Sequence

<400> 18  
ccataatcgt caggggaatg aaaaatgaca caa 33

<210> 19  
<211> 33  
<212> DNA  
<213> Artificial

<220>  
<223> Novel Sequence

<400> 19  
atttttcatt cccctgacga ttatggtgat tac 33

<210> 20  
<211> 33  
<212> DNA  
<213> Artificial

<220>  
<223> Novel Sequence

<400> 20  
tgatgaagaa agggcaccac atgatcagaa aca 33

<210> 21  
<211> 33  
<212> DNA  
<213> Artificial



## 9.W03

&lt;220&gt;

&lt;223&gt; Novel Sequence

&lt;400&gt; 21

gatcatgtgg tgccctttct tcatcacaaa cat

33

&lt;210&gt; 22

&lt;211&gt; 1416

&lt;212&gt; DNA

&lt;213&gt; Homo sapien

&lt;400&gt; 22

atggatattc tttgtgaaga aaatacttct ttgagctcaa ctacgaactc cctaattgcaa	60
ttaaattgatg acaacaggct ctacagtaat gactttaact ccggagaagc taacacttct	120
gatgcattta actggacagt cgactctgaa aatcgaacca acctttcctg tgaaggggtgc	180
ctctcaccgt cgtgtctctc cttacttcat ctccaggaaa aaaactgggc tgctttactg	240
acagccgtag tgattattct aactattgct ggaaacatac tcgtcatcat ggcagtgtcc	300
ctagagaaaa agctgcagaa tgccaccaac tatttcctga tgtcacttgc catagctgat	360
atgctgctgg gtttccttgt catgcccgtg tccatgttaa ccatcctgta tgggtaccgg	420
tggcctctgc cgagcaagct ttgtgcagtc tggatttacc tggacgtgct cttctccacg	480
gcctccatca tgcacctctg cgccatctcg ctggaccgct acgtcgccat ccagaatccc	540
atccaccaca gccgcttcaa ctccagaact aaggcatttc tgaaaatcat tgctgtttgg	600
accatatcag taggtatatc catgccaata ccagtctttg ggctacagga cgattcgaag	660
gtctttaagg aggggagttg cttactcgcc gatgataact ttgtcctgat cggctctttt	720
gtgtcatttt tcattccctt aaccatcatg gtgatcacct actttctaac tatcaagtca	780
ctccagaaag aagctacttt gtgtgtaagt gatcttggca cacgggccaa attagcttct	840
ttcagcttcc tccctcagag ttctttgtct tcagaaaagc tcttcagcg gtcgatccat	900
agggagccag ggtcctacac aggcaggagg actatgcagt ccatcagcaa tgagcaaaag	960
gcatgcaagg tgctgggcat cgtcttcttc ctgtttgtgg tgatgtggtg ccctttcttc	1020
atcacaacaa tcatggccgt catctgcaaa gagtcctgca atgaggatgt cattggggcc	1080
ctgctcaatg tgtttggttg gatcggttat ctctcttcag cagtcaacc actagtctac	1140
acactgttca acaagaccta taggtcagcc ttttcacggt atattcagtg tcagtacaag	1200
gaaaacaaaa aaccattgca gttaatttta gtgaacacaa taccggcttt ggcctacaag	1260
tctagccaac ttcaaatggg acaaaaaaag aattcaaagc aagatgccaa gacaacagat	1320
aatgactgct caatgggtgc tctaggaaag cagtattctg aagaggcttc taaagacaat	1380
agcgacggag tgaatgaaaa ggtgagctgt gtgtga	1416

&lt;210&gt; 23

&lt;211&gt; 471

&lt;212&gt; PRT

&lt;213&gt; Homo sapiens

## 9.W03

&lt;400&gt; 23

Met Asp Ile Leu Cys Glu Glu Asn Thr Ser Leu Ser Ser Thr Thr Asn  
 1 5 10 15

Ser Leu Met Gln Leu Asn Asp Asp Thr Arg Leu Tyr Ser Asn Asp Phe  
 20 25 30

Asn Ser Gly Glu Ala Asn Thr Ser Asp Ala Phe Asn Trp Thr Val Asp  
 35 40 45

Ser Glu Asn Arg Thr Asn Leu Ser Cys Glu Gly Cys Leu Ser Pro Ser  
 50 55 60

Cys Leu Ser Leu Leu His Leu Gln Glu Lys Asn Trp Ser Ala Leu Leu  
 65 70 75 80

Thr Ala Val Val Ile Ile Leu Thr Ile Ala Gly Asn Ile Leu Val Ile  
 85 90 95

Met Ala Val Ser Leu Glu Lys Lys Leu Gln Asn Ala Thr Asn Tyr Phe  
 100 105 110

Leu Met Ser Leu Ala Ile Ala Asp Met Leu Leu Gly Phe Leu Val Met  
 115 120 125

Pro Val Ser Met Leu Thr Ile Leu Tyr Gly Tyr Arg Trp Pro Leu Pro  
 130 135 140

Ser Lys Leu Cys Ala Val Trp Ile Tyr Leu Asp Val Leu Phe Ser Thr  
 145 150 155 160

Ala Ser Ile Met His Leu Cys Ala Ile Ser Leu Asp Arg Tyr Val Ala  
 165 170 175

Ile Gln Asn Pro Ile His His Ser Arg Phe Asn Ser Arg Thr Lys Ala  
 180 185 190

Phe Leu Lys Ile Ile Ala Val Trp Thr Ile Ser Val Gly Ile Ser Met  
 195 200 205

Pro Ile Pro Val Phe Gly Leu Gln Asp Asp Ser Lys Val Phe Lys Glu  
 210 215 220

Gly Ser Cys Leu Leu Ala Asp Asp Asn Phe Val Leu Ile Gly Ser Phe  
 225 230 235 240

Val Ser Phe Phe Ile Pro Leu Thr Ile Met Val Ile Thr Tyr Phe Leu  
 245 250 255

Thr Ile Lys Ser Leu Gln Lys Glu Ala Thr Leu Cys Val Ser Asp Leu  
 260 265 270

## 9.W03

Gly Thr Arg Ala Lys Leu Ala Ser Phe Ser Phe Leu Pro Gln Ser Ser  
           275                          280                          285  
 Leu Ser Ser Glu Lys Leu Phe Gln Arg Ser Ile His Arg Glu Pro Gly  
           290                          295                          300  
 Ser Tyr Thr Gly Arg Arg Thr Met Gln Ser Ile Ser Asn Glu Gln Lys  
   305                          310                          315                          320  
 Ala Cys Lys Val Leu Gly Ile Val Phe Phe Leu Phe Val Val Met Trp  
                           325                          330                          335  
 Cys Pro Phe Phe Ile Thr Asn Ile Met Ala Val Ile Cys Lys Glu Ser  
                           340                          345                          350  
 Cys Asn Glu Asp Val Ile Gly Ala Leu Leu Asn Val Phe Val Trp Ile  
                           355                          360                          365  
 Gly Tyr Leu Ser Ser Ala Val Asn Pro Leu Val Tyr Thr Leu Phe Asn  
   370                          375                          380  
 Lys Thr Tyr Arg Ser Ala Phe Ser Arg Tyr Ile Gln Cys Gln Tyr Lys  
   385                          390                          395                          400  
 Glu Asn Lys Lys Pro Leu Gln Leu Ile Leu Val Asn Thr Ile Pro Ala  
                           405                          410                          415  
 Leu Ala Tyr Lys Ser Ser Gln Leu Gln Met Gly Gln Lys Lys Asn Ser  
                           420                          425                          430  
 Lys Gln Asp Ala Lys Thr Thr Asp Asn Asp Cys Ser Met Val Ala Leu  
                           435                          440                          445  
 Gly Lys Gln His Ser Glu Glu Ala Ser Lys Asp Asn Ser Asp Gly Val  
   450                          455                          460  
 Asn Glu Lys Val Ser Cys Val  
   465                          470

<210> 24  
 <211> 1377  
 <212> DNA  
 <213> Homo sapien

<400> 24  
 atggtgaacc tgaggaatgc ggtgcattca ttccttgtgc acctaattgg cctattgggtt 60  
 tggcaatgtg atatttctgt gagcccagta gcagctatag taactgacat tttcaatacc 120  
 tccgatgggtg gacgcttcaa attcccagac ggggtacaaa actggccagc acttttcaatc 180  
 gtcatacataa taatcatgac aataggtggc aacatccttg tgatcatggc agtaagcatg 240

9.W03

```

gaaaagaaac tgcacaatgc caccaattac ttcttaatgt ccctagccat tgctgatatg    300
ctagtgggac tacttgtcat gcccctgtct ctccctggcaa tcctttatga ttatgtctgg    360
ccactaccta gatatttgtg ccccgctctg atttcttttag atgttttatt ttcaacagcg    420
tccatcatgc acctctgctg tatatcgctg gatcgggatg tagcaatacg taatcctatt    480
gagcatagcc gtttcaattc gcggactaag gccatcatga agattgctat tgtttgggca    540
atttctatag gtgtatcagt tcctatccct gtgattggac tgaggggacga agaaaagggtg    600
ttcgtgaaca acacgacgtg cgtgctcaac gacccaaatt tcgttcttat tgggtccttc    660
gtagctttct tcataccgct gacgattatg gtgattacgt attgcctgac catctacgtt    720
ctgcgccgac aagctttgat gttactgcac ggccacaccg aggaaccgcc tggactaagt    780
ctggatttcc tgaagtgctg caagaggaat acggccgagg aagagaactc tgcaaaccct    840
aaccaagacc agaacgcacg ccgaagaaag aagaaggaga gacgtcctag gggcaccatg    900
caggctatca acaatgaaag aaaagcttcg aaagtccttg ggattgtttt ctttgtgttt    960
ctgatcatgt ggtgcccatt tttcattacc aatattctgt ctgttctttg tgagaagtcc   1020
tgtaaccaa agctcatgga aaagcttctg aatgtgtttg tttggattgg ctatgtttgt   1080
tcaggaatca atcctctggt gtatctctgt ttcaacaaaa tttaccgaag ggcatttctc   1140
aactatttgc gttgcaatta taaggtagag aaaaagcctc ctgtcaggca gattccaaga   1200
gttgccgcca ctgctttgtc tgggagggag cttaatgtta acatttatcg gcataccaat   1260
gaaccggtga tcgagaaagc cagtgacaat gagcccggta tagagatgca agttgagaat   1320
ttagagttac cagtaaatacc ctccagtgtg gttagcgaaa ggattagcag tgtgtga     1377

```

<210> 25  
 <211> 458  
 <212> PRT  
 <213> Homo sapiens

<400> 25

Met Val Asn Leu Arg Asn Ala Val His Ser Phe Leu Val His Leu Ile  
 1 5 10 15

Gly Leu Leu Val Trp Gln Cys Asp Ile Ser Val Ser Pro Val Ala Ala  
 20 25 30

Ile Val Thr Asp Ile Phe Asn Thr Ser Asp Gly Gly Arg Phe Lys Phe  
 35 40 45

Pro Asp Gly Val Gln Asn Trp Pro Ala Leu Ser Ile Val Ile Ile Ile  
 50 55 60

Ile Met Thr Ile Gly Gly Asn Ile Leu Val Ile Met Ala Val Ser Met  
 65 70 75 80

Glu Lys Lys Leu His Asn Ala Thr Asn Tyr Phe Leu Met Ser Leu Ala  
 85 90 95

## 9.W03

Ile Ala Asp Met<sub>100</sub> Leu Val Gly Leu Leu<sub>105</sub> Val Met Pro Leu Ser<sub>110</sub> Leu Leu  
 Ala Ile Leu<sub>115</sub> Tyr Asp Tyr Val Trp<sub>120</sub> Pro Leu Pro Arg Tyr<sub>125</sub> Leu Cys Pro  
 Val Trp<sub>130</sub> Ile Ser Leu Asp Val<sub>135</sub> Leu Phe Ser Thr Ala<sub>140</sub> Ser Ile Met His  
 Leu<sub>145</sub> Cys Ala Ile Ser Leu<sub>150</sub> Asp Arg Tyr Val Ala<sub>155</sub> Ile Arg Asn Pro Ile<sub>160</sub>  
 Glu His Ser Arg Phe<sub>165</sub> Asn Ser Arg Thr Lys<sub>170</sub> Ala Ile Met Lys Ile<sub>175</sub> Ala  
 Ile Val Trp Ala<sub>180</sub> Ile Ser Ile Gly Val<sub>185</sub> Ser Val Pro Ile Pro<sub>190</sub> Val Ile  
 Gly Leu Arg<sub>195</sub> Asp Glu Glu Lys Val<sub>200</sub> Phe Val Asn Asn Thr<sub>205</sub> Thr Cys Val  
 Leu Asn<sub>210</sub> Asp Pro Asn Phe Val<sub>215</sub> Leu Ile Gly Ser Phe<sub>220</sub> Val Ala Phe Phe  
 Ile<sub>225</sub> Pro Leu Thr Ile Met<sub>230</sub> Val Ile Thr Tyr Cys<sub>235</sub> Leu Thr Ile Tyr Val<sub>240</sub>  
 Leu Arg Arg Gln Ala<sub>245</sub> Leu Met Leu Leu His<sub>250</sub> Gly His Thr Glu Glu<sub>255</sub> Pro  
 Pro Gly Leu Ser<sub>260</sub> Leu Asp Phe Leu Lys<sub>265</sub> Cys Cys Lys Arg Asn<sub>270</sub> Thr Ala  
 Glu Glu Glu<sub>275</sub> Asn Ser Ala Asn Pro<sub>280</sub> Asn Gln Asp Gln Asn<sub>285</sub> Ala Arg Arg  
 Arg Lys<sub>290</sub> Lys Lys Glu Arg Arg<sub>295</sub> Pro Arg Gly Thr Met<sub>300</sub> Gln Ala Ile Asn  
 Asn<sub>305</sub> Glu Arg Lys Ala Ser<sub>310</sub> Lys Val Leu Gly Ile<sub>315</sub> Val Phe Phe Val Phe<sub>320</sub>  
 Leu Ile Met Trp Cys<sub>325</sub> Pro Phe Phe Ile Thr<sub>330</sub> Asn Ile Leu Ser Val<sub>335</sub> Leu  
 Cys Glu Lys Ser<sub>340</sub> Cys Asn Gln Lys Leu<sub>345</sub> Met Glu Lys Leu Leu<sub>350</sub> Asn Val  
 Phe Val Trp<sub>355</sub> Ile Gly Tyr Val Cys<sub>360</sub> Ser Gly Ile Asn Pro<sub>365</sub> Leu Val Tyr

## 9.W03

Thr Leu Phe Asn Lys Ile Tyr Arg Arg Ala Phe Ser Asn Tyr Leu Arg  
 370 375 380

Cys Asn Tyr Lys Val Glu Lys Lys Pro Pro Val Arg Gln Ile Pro Arg  
 385 390 395 400

Val Ala Ala Thr Ala Leu Ser Gly Arg Glu Leu Asn Val Asn Ile Tyr  
 405 410 415

Arg His Thr Asn Glu Pro Val Ile Glu Lys Ala Ser Asp Asn Glu Pro  
 420 425 430

Gly Ile Glu Met Gln Val Glu Asn Leu Glu Leu Pro Val Asn Pro Ser  
 435 440 445

Ser Val Val Ser Glu Arg Ile Ser Ser Val  
 450 455

<210> 26  
 <211> 1377  
 <212> DNA  
 <213> Artificial

<220>  
 <223> Novel Sequence

<400> 26  
 atggtgaacc tgaggaatgc ggtgcattca ttccttgtgc acctaattgg cctattgggtt 60  
 tggcaatgtg atatttctgt gagccagta gcagctatag taactgacat tttcaataacc 120  
 tccgatggtg gacgcttcaa attcccagac ggggtacaaa actggccagc actttcaatc 180  
 gtcatcataa taatcatgac aataggtggc aacatccttg tgatcatggc agtaagcatg 240  
 gaaaagaaac tgcacaatgc caccaattac ttcttaatgt ccctagccat tgctgatatg 300  
 ctagtgggac tacttgtcat gccctgtct ctcctggcaa tcctttatga ttatgtctgg 360  
 ccactaccta gatatttgtg ccccgctctg atttcttttag atgttttatt ttcaacagcg 420  
 tccatcatgc acctctgcgc tatatcgctg gatcggtatg tagcaatacg taatcctatt 480  
 gagcatagcc gtttcaattc gcggactaag gccatcatga agattgctat tgtttgggca 540  
 atttctatag gtgtatcagt tcctatccct gtgattggac tgagggacga agaaaagggtg 600  
 ttcgtgaaca acacgacgtg cgtgctcaac gacccaaatt tcgttcttat tgggtccttc 660  
 gtagctttct tcataccgct gacgattatg gtgattacgt attgcctgac catctacgtt 720  
 ctgcgccgac aagctttgat gttactgcac ggccacaccg aggaaccgcc tggactaagt 780  
 ctggatttcc tgaagtgtg caagaggaat acggccgagg aagagaactc tgcaaaccct 840  
 aaccaagacc agaacgcacg ccgaagaaag aagaaggaga gacgtcctag gggcaccatg 900  
 caggctatca acaatgaaag aaaagctaag aaagtccttg ggattgtttt ctttgtgttt 960  
 ctgatcatgt ggtgcccatt tttcattacc aataattctat ctattctttg tgagaagtcc 1020

## 9.W03

tgtaacccaaa agctcatgga aaagcttctg aatgtgtttg tttggattgg ctatgtttgt 1080  
 tcaggaatca atcctctgggt gtatactctg ttcaacaaaa tttaccgaag ggcattctcc 1140  
 aactattttgc gttgcaatta taaggtagag aaaaagcctc ctgtcaggca gattccaaga 1200  
 gttgcccgcca ctgctttgtc tgggagggag cttaatgtta acatttatcg gcataccaat 1260  
 gaaccggtga tcgagaaagc cagtgacaat gagcccggta tagagatgca agttgagaat 1320  
 ttagagttac cagtaaattcc ctccagtgtg gtttagcgaaa ggattagcag tgtgtga 1377

<210> 27  
 <211> 458  
 <212> PRT  
 <213> Artificial

<220>  
 <223> Novel Sequence

<400> 27

Met Val Asn Leu Arg Asn Ala Val His Ser Phe Leu Val His Leu Ile  
1 5 10 15

Gly Leu Leu Val Trp Gln Cys Asp Ile Ser Val Ser Pro Val Ala Ala  
20 25 30

Ile Val Thr Asp Ile Phe Asn Thr Ser Asp Gly Gly Arg Phe Lys Phe  
35 40 45

Pro Asp Gly Val Gln Asn Trp Pro Ala Leu Ser Ile Val Ile Ile Ile  
50 55 60

Ile Met Thr Ile Gly Gly Asn Ile Leu Val Ile Met Ala Val Ser Met  
65 70 75 80

Glu Lys Lys Leu His Asn Ala Thr Asn Tyr Phe Leu Met Ser Leu Ala  
85 90 95

Ile Ala Asp Met Leu Val Gly Leu Leu Val Met Pro Leu Ser Leu Leu  
100 105 110

Ala Ile Leu Tyr Asp Tyr Val Trp Pro Leu Pro Arg Tyr Leu Cys Pro  
115 120 125

Val Trp Ile Ser Leu Asp Val Leu Phe Ser Thr Ala Ser Ile Met His  
130 135 140

Leu Cys Ala Ile Ser Leu Asp Arg Tyr Val Ala Ile Arg Asn Pro Ile  
145 150 155 160

Glu His Ser Arg Phe Asn Ser Arg Thr Lys Ala Ile Met Lys Ile Ala  
165 170 175

Ile Val Trp Ala Ile Ser Ile Gly Val Ser Val Pro Ile Pro Val Ile  
 180 185 190

Gly Leu Arg Asp Glu Glu Lys Val Phe Val Asn Asn Thr Thr Cys Val  
 195 200 205

Leu Asn Asp Pro Asn Phe Val Leu Ile Gly Ser Phe Val Ala Phe Phe  
 210 215 220

Ile Pro Leu Thr Ile Met Val Ile Thr Tyr Cys Leu Thr Ile Tyr Val  
 225 230 235 240

Leu Arg Arg Gln Ala Leu Met Leu Leu His Gly His Thr Glu Glu Pro  
 245 250 255

Pro Gly Leu Ser Leu Asp Phe Leu Lys Cys Cys Lys Arg Asn Thr Ala  
 260 265 270

Glu Glu Glu Asn Ser Ala Asn Pro Asn Gln Asp Gln Asn Ala Arg Arg  
 275 280 285

Arg Lys Lys Lys Glu Arg Arg Pro Arg Gly Thr Met Gln Ala Ile Asn  
 290 295 300

Asn Glu Arg Lys Ala Lys Lys Val Leu Gly Ile Val Phe Phe Val Phe  
 305 310 315 320

Leu Ile Met Trp Cys Pro Phe Phe Ile Thr Asn Ile Leu Ser Val Leu  
 325 330 335

Cys Glu Lys Ser Cys Asn Gln Lys Leu Met Glu Lys Leu Leu Asn Val  
 340 345 350

Phe Val Trp Ile Gly Tyr Val Cys Ser Gly Ile Asn Pro Leu Val Tyr  
 355 360 365

Thr Leu Phe Asn Lys Ile Tyr Arg Arg Ala Phe Ser Asn Tyr Leu Arg  
 370 375 380

Cys Asn Tyr Lys Val Glu Lys Lys Pro Pro Val Arg Gln Ile Pro Arg  
 385 390 395 400

Val Ala Ala Thr Ala Leu Ser Gly Arg Glu Leu Asn Val Asn Ile Tyr  
 405 410 415

Arg His Thr Asn Glu Pro Val Ile Glu Lys Ala Ser Asp Asn Glu Pro  
 420 425 430

Gly Ile Glu Met Gln Val Glu Asn Leu Glu Leu Pro Val Asn Pro Ser  
 435 440 445



Ser Val Val Ser Glu Arg Ile Ser Ser Val 9.W03  
 450 455

<210> 28  
 <211> 1437  
 <212> DNA  
 <213> Artificial

<220>  
 <223> Novel Sequence

<400> 28  
 atggatattc tttgtgaaga aaatacttct ttgagctcaa ctacgaactc cctaattgcaa 60  
 ttaaatgatg acaacaggct ctacagtaat gactttaact ccggagaagc taacacttct 120  
 gatgcattta actggacagt cgactctgaa aatcgaacca acctttcctg tgaaggggtgc 180  
 ctctcaccgt cgtgtctctc cttacttcat ctccaggaaa aaaactgggc tgctttactg 240  
 acagccgtag tgattattct aactattgct ggaaacatac tcgtcatcat ggcagtgtcc 300  
 ctagagaaaa agctgcagaa tgccaccaac tatttcctga tgtcacttgc catagctgat 360  
 atgctgctgg gtttccttgt catgcccgtg tccatgttaa ccatcctgta tgggtaccgg 420  
 tggcctctgc cgagcaagct ttgtgcagtc tggatttacc tggacgtgct cttctccacg 480  
 gcctccatca tgcacctctg cgccatctcg ctggaccgct acgtcgccat ccagaatccc 540  
 atccaccaca gccgcttcaa ctccagaact aaggcatttc tgaaaatcat tgctgtttgg 600  
 accatatcag taggtatatc catgccaaata ccagtctttg ggctacagga cgattcgaag 660  
 gtctttaagg aggggagttg cttactcgcc gatgataact ttgtcctgat cggctctttt 720  
 gtgtcatttt tcattccctt aaccatcatg gtgatcacct actttctaac tatcaagggtt 780  
 ctgcgccgac aagctttgat gttactgcac ggccacaccg aggaaccgcc tggactaagt 840  
 ctggatttcc tgaagtgtg caagaggaat acggccgagg aagagaactc tgcaaaccct 900  
 aaccaagacc agaacgcacg ccgaagaaag aagaaggaga gacgtcctag gggcaccatg 960  
 caggctatca acaatgaaag aaaagcttcg aagggtactgg gcatcgtctt cttcctgttt 1020  
 gtgggtgatgt ggtgcccttt cttcatcaca aacatcatgg ccgtcatctg caaagagtcc 1080  
 tgcaatgagg atgtcattgg ggccctgctc aatgtgtttg tttggatcgg ttatctctct 1140  
 tcagcagtca acccactagt ctatactctg ttcaacaaaa ttaccgaag ggcattctcc 1200  
 aactatttgc gttgcaatta taaggtagag aaaaagcctc ctgtcaggca gattccaaga 1260  
 gttgccgcca ctgctttgtc tgggagggag cttaatgtta acatttatcg gcataccaat 1320  
 gaaccggtga tcgagaaagc cagtgacaat gagcccggta tagagatgca agttgagaat 1380  
 ttagagttac cagtaaattc ctccagtgtg gttagcgaag ggattagcag tgtgtga 1437

<210> 29  
 <211> 478  
 <212> PRT  
 <213> Artificial

<220>

## 9.W03

&lt;223&gt; Novel Sequence

&lt;400&gt; 29

Met Asp Ile Leu Cys Glu Glu Asn Thr Ser Leu Ser Ser Thr Thr Asn  
 1 5 10 15  
 Ser Leu Met Gln Leu Asn Asp Asp Asn Arg Leu Tyr Ser Asn Asp Phe  
 20 25 30  
 Asn Ser Gly Glu Ala Asn Thr Ser Asp Ala Phe Asn Trp Thr Val Asp  
 35 40 45  
 Ser Glu Asn Arg Thr Asn Leu Ser Cys Glu Gly Cys Leu Ser Pro Ser  
 50 55 60  
 Cys Leu Ser Leu Leu His Leu Gln Glu Lys Asn Trp Ser Ala Leu Leu  
 65 70 75 80  
 Thr Ala Val Val Ile Ile Leu Thr Ile Ala Gly Asn Ile Leu Val Ile  
 85 90 95  
 Met Ala Val Ser Leu Glu Lys Lys Leu Gln Asn Ala Thr Asn Tyr Phe  
 100 105 110  
 Leu Met Ser Leu Ala Ile Ala Asp Met Leu Leu Gly Phe Leu Val Met  
 115 120 125  
 Pro Val Ser Met Leu Thr Ile Leu Tyr Gly Tyr Arg Trp Pro Leu Pro  
 130 135 140  
 Ser Lys Leu Cys Ala Val Trp Ile Tyr Leu Asp Val Leu Phe Ser Thr  
 145 150 155 160  
 Ala Ser Ile Met His Leu Cys Ala Ile Ser Leu Asp Arg Tyr Val Ala  
 165 170 175  
 Ile Gln Asn Pro Ile His His Ser Arg Phe Asn Ser Arg Thr Lys Ala  
 180 185 190  
 Phe Leu Lys Ile Ile Ala Val Trp Thr Ile Ser Val Gly Ile Ser Met  
 195 200 205  
 Pro Ile Pro Val Phe Gly Leu Gln Asp Asp Ser Lys Val Phe Lys Glu  
 210 215 220  
 Gly Ser Cys Leu Leu Ala Asp Asp Asn Phe Val Leu Ile Gly Ser Phe  
 225 230 235 240  
 Val Ser Phe Phe Ile Pro Leu Thr Ile Met Val Ile Thr Tyr Phe Leu  
 245 250 255

```
<400> 30
atggatattc tttgtgaaga aaatacttct ttgagctcaa ctacgaactc cctaatgcaa 60
ttaaatgatg acaacaggct ctacagtaat gactttaact ccdaagaagc taacacttct 120
```

## 9.W03

```

gatgcattta actggacagt cgactctgaa aatcgaacca acctttcctg tgaaggggtgc 180
ctctcaccgt cgtgtctctc cttacttcat ctccaggaaa aaaactggtc tgctttactg 240
acagccgtag tgattattct aactattgct ggaaacatac tcgtcatcat ggcaagtgtcc 300
ctagagaaaa agctgcagaa tgccaccaac tatttcctga tgtcacttgc catagctgat 360
atgctgctgg gtttccttgt catgcccgtg tccatgttaa ccatcctgta tgggtaccgg 420
tggcctctgc cgagcaagct ttgtgcagtc tggatttacc tggacgtgct cttctccacg 480
gcctccatca tgcacctctg cgccatctcg ctggaccgct acgtcgccat ccagaatccc 540
atccaccaca gccgcttcaa ctccagaact aaggcatttc tgaatatcat tgctgtttgg 600
accatatcag taggtatatc catgccaata ccagtctttg ggctacagga cgattcgaag 660
gtctttaagg aggggagttg cttactcgcc gatgataact ttgtcctgat cggctctttt 720
gtgtcatttt tcattcccct gacgattatg gtgattacgt attgcctgac catctacgtt 780
ctgcgccgac aagctttgat gttactgcac ggccacaccg aggaaccgcc tggactaagt 840
ctggatttcc tgaagtgtcg caagaggaat acggccgagg aagagaactc tgcaaaccct 900
aaccaagacc agaacgcacg ccgaagaaag aagaaggaga gacgtcctag gggcaccatg 960
caggctatca acaatgaaag aaaagctaag aaagtccttg ggattgtttt ctttgtgttt 1020
ctgatcatgt ggtgcccttt cttcatcaca aacatcatgg ccgtcatctg caaagagtcc 1080
tgcaatgagg atgtcattgg ggccctgctc aatgtgtttg tttggatcgg ttatctctct 1140
tcagcagtca acccactagt ctatactctg ttcaacaaaa tttaccgaag ggcattctcc 1200
aactatttgc gttgcaatta taaggtagag aaaaagcctc ctgtcaggca gattccaaga 1260
gttgccgcca ctgctttgtc tgggagggag cttaatgtta acatttatcg gcataccaat 1320
gaaccggtga tcgagaaagc cagtgacaat gagcccggta tagagatgca agttgagaat 1380
ttagagttac cagtaaattc ctccagtgtg gtagcgaaa ggattagcag tgtgtga 1437

```

<210> 31  
 <211> 478  
 <212> PRT  
 <213> Artificial

<220>  
 <223> Novel Sequence

<400> 31

Met Asp Ile Leu Cys Glu Glu Asn Thr Ser Leu Ser Ser Thr Thr Asn  
 1 5 10 15

Ser Leu Met Gln Leu Asn Asp Asp Asn Arg Leu Tyr Ser Asn Asp Phe  
 20 25 30

Asn Ser Gly Glu Ala Asn Thr Ser Asp Ala Phe Asn Trp Thr Val Asp  
 35 40 45

Ser Glu Asn Arg Thr Asn Leu Ser Cys Glu Gly Cys Leu Ser Pro Ser  
 50 55 60

Cys Leu Ser Leu Leu His Leu Gln Glu Lys Asn Trp Ser Ala Leu Leu  
 65 70 75 80

Thr Ala Val Val Ile Ile Leu Thr Ile Ala Gly Asn Ile Leu Val Ile  
 85 90 95

Met Ala Val Ser Leu Glu Lys Lys Leu Gln Asn Ala Thr Asn Tyr Phe  
 100 105 110

Leu Met Ser Leu Ala Ile Ala Asp Met Leu Leu Gly Phe Leu Val Met  
 115 120 125

Pro Val Ser Met Leu Thr Ile Leu Tyr Gly Tyr Arg Trp Pro Leu Pro  
 130 135 140

Ser Lys Leu Cys Ala Val Trp Ile Tyr Leu Asp Val Leu Phe Ser Thr  
 145 150 155 160

Ala Ser Ile Met His Leu Cys Ala Ile Ser Leu Asp Arg Tyr Val Ala  
 165 170 175

Ile Gln Asn Pro Ile His His Ser Arg Phe Asn Ser Arg Thr Lys Ala  
 180 185 190

Phe Leu Lys Ile Ile Ala Val Trp Thr Ile Ser Val Gly Ile Ser Met  
 195 200 205

Pro Ile Pro Val Phe Gly Leu Gln Asp Asp Ser Lys Val Phe Lys Glu  
 210 215 220

Gly Ser Cys Leu Leu Ala Asp Asp Asn Phe Val Leu Ile Gly Ser Phe  
 225 230 235 240

Val Ser Phe Phe Ile Pro Leu Thr Ile Met Val Ile Thr Tyr Cys Leu  
 245 250 255

Thr Ile Tyr Val Leu Arg Arg Gln Ala Leu Met Leu Leu His Gly His  
 260 265 270

Thr Glu Glu Pro Pro Gly Leu Ser Leu Asp Phe Leu Lys Cys Cys Lys  
 275 280 285

Arg Asn Thr Ala Glu Glu Glu Asn Ser Ala Asn Pro Asn Gln Asp Gln  
 290 295 300

Asn Ala Arg Arg Arg Lys Lys Lys Glu Arg Arg Pro Arg Gly Thr Met  
 305 310 315 320

Gln Ala Ile Asn Asn Glu Arg Lys Ala Lys Lys Val Leu Gly Ile Val  
 325 330 335

Phe Phe Val Phe Leu Ile Met Trp Cys Pro Phe Phe Ile Thr Asn Ile  
 340 345 350

Met Ala Val Ile Cys Lys Glu Ser Cys Asn Glu Asp Val Ile Gly Ala  
 355 360 365

Leu Leu Asn Val Phe Val Trp Ile Gly Tyr Leu Ser Ser Ala Val Asn  
 370 375 380

Pro Leu Val Tyr Thr Leu Phe Asn Lys Ile Tyr Arg Arg Ala Phe Ser  
 385 390 395 400

Asn Tyr Leu Arg Cys Asn Tyr Lys Val Glu Lys Lys Pro Pro Val Arg  
 405 410 415

Gln Ile Pro Arg Val Ala Ala Thr Ala Leu Ser Gly Arg Glu Leu Asn  
 420 425 430

Val Asn Ile Tyr Arg His Thr Asn Glu Pro Val Ile Glu Lys Ala Ser  
 435 440 445

Asp Asn Glu Pro Gly Ile Glu Met Gln Val Glu Asn Leu Glu Leu Pro  
 450 455 460

Val Asn Pro Ser Ser Val Val Ser Glu Arg Ile Ser Ser Val  
 465 470 475

(19) World Intellectual Property  
Organization  
International Bureau



(43) International Publication Date  
31 July 2003 (31.07.2003)

PCT

(10) International Publication Number  
**WO 2003/062206 A3**

(51) International Patent Classification<sup>7</sup>: **C07D 231/16**,  
231/14, 231/12, 401/12, 409/04, A61K 31/415, 31/4155,  
A61P 7/02, 9/10

(21) International Application Number:  
PCT/US2003/002059

(22) International Filing Date: 23 January 2003 (23.01.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
60/386,198 23 January 2002 (23.01.2002) US  
60/386,384 5 June 2002 (05.06.2002) US  
60/401,467 5 August 2002 (05.08.2002) US

(71) Applicant (for all designated States except US): **ARENA PHARMACEUTICALS, INC.** [US/US]; 6166 Nancy Ridge Drive, San Diego, CA 92121 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **TEEGARDEN, Bradley** [US/US]; 11933 Windom Peak Way, San Diego, CA 92131 (US). **DROUET, Keith** [US/US]; 10751 Juniper Park Lane, San Diego, CA 92121 (US). **JAYAKUMAR, Honnappa** [US/US]; 13323 Caminito Ciera, #107, San Diego, CA 92129 (US). **THOMSEN, William** [US/US]; 13603 Mar Scenic, Del Mar, CA 92014 (US). **MAFFUID, Paul** [US/US]; 3326 Avenida Anacapa, Carlsbad, CA 92009 (US). **ELWELL, Katie** [US/US]; 103 Guerrero Court, Solana Beach, CA 92075 (US). **FOSTER, Richard** [GB/GB]; Puffins Cottage, Poundstock Bude, Cornwall EX23 0AX (GB). **LAWLESS, Michael** [US/US]; 1847 Willow Oak Drive, St. Charles, MO 63303 (US). **LIU,**

**Qian** [US/US]; 310 Shady Meadows Drive, Ballwin, MO 63011 (US). **SMITH, Julian** [GB/GB]; 2 Exeview Cottages, Whitestone, Exeter, Devon EX4 2JJ (GB). **FEICHTINGER, Konrad** [DE/US]; 3533 6th Avenue, #3, San Diego, CA 92103 (US).

(74) Agents: **BRADFUTE, David** et al.; Arena Pharmaceuticals, Inc., 6166 Nancy Ridge Drive, San Diego, CA 92121 (US).

(81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— with international search report

(88) Date of publication of the international search report:  
8 January 2004

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: SMALL MOLECULE MODULATORS OF THE 5-HT<sub>2A</sub> SEROTONIN RECEPTOR USEFUL FOR THE PROPHYLAXIS AND TREATMENT OF DISORDERS RELATED THERETO

(57) Abstract: The present invention relates to certain pyrazole derivatives of Formula (I) and pharmaceutical compositions thereof that modulate the activity of the 5-HT<sub>2A</sub> serotonin receptor. Formula (I): Compounds and pharmaceutical compositions thereof are directed to methods useful in the prophylaxis or treatment of reducing platelet aggregation, coronary artery disease, myocardial infarction, transient ischemic attack, angina, stroke, atrial fibrillation, reducing the risk of blood clot formation, asthma or symptoms thereof, agitation or a symptom, behavioral disorders, drug induced psychosis, excitative psychosis, Gilles de la Tourette's syndrome, manic disorder, organic or NOS psychosis, psychotic disorder, psychosis, acute schizophrenia, chronic schizophrenia and NOS schizophrenia and related disorders. The present invention also relates to the method of prophylaxis or treatment of 5-HT<sub>2A</sub> serotonin receptor mediated disorders in combination with a dopamine D2 receptor antagonist such as haloperidol, administered separately or together.



WO 2003/062206 A3

International Application No  
PCT/US 03/02059

IPC 7	C07D231/16	C07D231/14	C07D231/12	C07D401/12	C07D409/04
	A61K31/415	A61K31/4155	A61P7/02	A61P9/10	

#### B. FIELDS SEARCHED

IPC 7 C07D

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, CHEM ABS Data

### C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	<p>WO 99 52927 A (SMITH JULIAN R; FOSTER RICHARD J (GB); ARENA PHARMACEUTICALS INC)  21 October 1999 (1999-10-21)  page 31, line 8 -page 37, line 9  page 39 -page 45  page 47 -page 49, line 4  page 51 -page 54  claims 14-20</p> <p>---</p>	1-166
A	<p>WO 98 24785 A (KATO MASAYUKI; NODA YUKA (JP); SPEARS GLEN W (JP); HARADA KEIKO (J)  11 June 1998 (1998-06-11)  claims 1,2,5-8; examples</p> <p>---</p>	1,45,88, 129-166
A	<p>US 5 281 571 A (MISCHKE DEBORAH A ET AL)  25 January 1994 (1994-01-25)  claims 1-3</p> <p>---</p>	1,45,88

-/--

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

° Special categories of cited documents :

- "A" document defining the general state of the art which is not *considered to be of particular relevance*
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- "&" document member of the same patent family

Date of the actual completion of the international search

2 October 2003

Date of mailing of the international search report

10/10/2003

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax: (+31-70) 340-3016

Authorized officer

Hass, C



# INTERNATIONAL SEARCH REPORT

International Application No  
PCT/US 03/02059

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,X	<p>WO 02 076464 A (ARENA PHARMACEUTICALS INC; MENZAGHI FREDERIQUE (US); BEHAN DOMINIC) 3 October 2002 (2002-10-03)</p> <p>claims -----</p>	<p>1-3,7,8, 16-21, 24-30, 33, 45-47, 51,52, 60-65, 68-74, 77,129, 130, 132-166</p>

# INTERNATIONAL SEARCH REPORT

international application No.  
PCT/US 03/02059

## Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☒ Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:  
  
Although claims 129-131, 133-154 are directed to a method of treatment of the human/animal body, the search has been carried out and based on the alleged effects of the compound/composition.
2. ☐ Claims Nos.:  
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

### Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 03/02059

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
WO 9952927	A	21-10-1999	AU 764766 B2	28-08-2003
			AU 3746699 A	01-11-1999
			CA 2325559 A1	21-10-1999
			DE 1071701 T1	23-08-2001
			EP 1071701 A1	31-01-2001
			ES 2156845 T1	01-08-2001
			JP 2003514763 T	22-04-2003
			US 2003023069 A1	30-01-2003
			WO 9952927 A1	21-10-1999
			US 6555339 B1	29-04-2003
			US 2003153004 A1	14-08-2003
			US 6107324 A	22-08-2000
			US 6541209 B1	01-04-2003
			US 6426541 B1	16-07-2002
			US 6420541 B1	16-07-2002
			US 2003105292 A1	05-06-2003
			US 6140509 A	31-10-2000
			US 6150393 A	21-11-2000
WO 9824785	A	11-06-1998	AU 5068298 A	29-06-1998
			WO 9824785 A1	11-06-1998
			JP 2001508767 T	03-07-2001
US 5281571	A	25-01-1994	AT 174330 T	15-12-1998
			AU 653758 B2	13-10-1994
			AU 8927591 A	20-05-1992
			BG 97638 A	31-03-1994
			BR 9107049 A	28-09-1993
			CA 2092083 A1	19-04-1992
			CN 1061777 A ,B	10-06-1992
			CN 1090845 A ,B	17-08-1994
			CZ 9300637 A3	15-12-1993
			DE 69130614 D1	21-01-1999
			DE 69130614 T2	08-07-1999
			DK 553307 T3	16-08-1999
			EP 0553307 A1	04-08-1993
			EP 0791571 A1	27-08-1997
			ES 2059290 T1	16-11-1994
			FI 931708 A	10-06-1993
			GR 3029621 T3	30-06-1999
			HU 64310 A2	28-12-1993
			HU 219574 B	28-05-2001
			IE 913642 A1	22-04-1992
			IE 990098 A1	01-11-2000
			JP 6502637 T	24-03-1994
			MX 9101637 A1	05-06-1992
			NZ 240282 A	27-04-1994
			PT 99261 A ,B	31-08-1992
			RU 2137761 C1	20-09-1999
			SK 35993 A3	07-07-1993
			WO 9206962 A1	30-04-1992
			US 5489571 A	06-02-1996
			US 5536700 A	16-07-1996
			US 5530126 A	25-06-1996
			US 5600008 A	04-02-1997
			US 5600016 A	04-02-1997
			US 5496956 A	05-03-1996
			US 5866723 A	02-02-1999

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 03/02059

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5281571	A	PL 168964 B1	31-05-1996
		PL 170158 B1	31-10-1996
		PL 169882 B1	30-09-1996
		ZA 9108291 A	26-08-1992
WO 02076464	A	03-10-2002	WO 02076464 A1
			US 2002156068 A1
			24-10-2002